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AUTO ION SITE
KALAMAZOO, MICHIGAN

K.08
6/1/92

REMEDIAL INVESTIGATION ADDENDUM

PROJECT #684-03
JUNE 1992

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1.0 INTRODUCTION

1.1 Purpose

This Remedial Investigation Addendum supplements the Remedial Investigation (RI) report for the Auto Ion Site (Site) in Kalamazoo, Michigan. The original RI was designed to determine the extent of impacted environmental media at the site in sufficient detail to support a feasibility study which included two rounds of groundwater sampling and static water level measurement, and was completed in December, 1988. In a letter dated April 9, 1990, the United States Environmental Protection Agency (USEPA) requested an additional round of groundwater sampling and static water elevations be performed to amend the original RI report.

In 1990 Eder Associates Consulting Engineers, P.C. (EA) was retained by the Auto Ion Steering Committee, a group of Potentially Responsible Parties (PRP's), to implement a third groundwater sampling round and obtain groundwater elevations. The objective of this additional effort was to resolve the wide variability in the data results between the two previous rounds of ground water sampling and water table measurements. All work performed was completed in accordance with the Quality Assurance Project Plan (QAPP), which was approved by the EPA on 11/20/90. The data quality objectives specified in the USEPA approved QAPP were met and are documented in Appendix A. CLP data packages were submitted under separate cover to USEPA on February 4, 1991.

1.2 Site Description

The Site is located at 74 Mills Street in a commercial/ industrial district of northeast Kalamazoo, Michigan. The Site occupies approximately 1.5 acres of fenced land adjacent to the Kalamazoo River. The Site is bordered to the north by O'Neil Street, to the east by Mills Street, to the south by the Kalamazoo

River, and to the west by a painting Facility.

The population of Kalamazoo, Michigan, was reportedly 80,277 as of the 1990 census. The nearest residence to the site is located approximately 500 feet north of the site along Mill Street.

The area around the site is supplied drinking water by the City of Kalamazoo. In Section 2.1 of the original December 1988 RI Reports, potential groundwater receptors are discussed.

The nearest wetlands to the site is over one and three quarters of a mile downstream on the Kalamazoo River, based on review of a Kalamazoo wetlands map prepared by the Michigan Department of Natural Resources, Michigan Resource Information System Land and Water Management Division, 1978. This wetland is a shrub, emergent, and aquatic bed. It is located downstream of the Portage River confluent and the Kalamazoo Sewage Treatment Plant. Both of these areas are known sources of contamination to the Kalamazoo River. Potential environmental impact to wetlands from the Auto Ion site will be addressed in the baseline risk assessment in the Operable Unit II FS.

The Kalamazoo River is currently listed on the National Priorities List (NPL) and as an Act 307 (Michigan Public Act 307) site. This listing covers the entire river, beginning with a location approximately one mile upstream of the site and continuing 80 miles to Lake Michigan.

1.3 Site History

The Site was used as an electrical generating station by the City of Kalamazoo from 1914 until 1956, when Consumers Power purchased the plant. Shortly thereafter the power plant was closed and dismantled. The Auto Ion Chemical Company (AICC) commenced operations at the Site in 1964. The AICC was originally designed

as a waste treatment facility for electroplating wastes. AICC received chrome and cyanide-bearing plating waste for treatment. Waste treatment operations included cyanide destruction and precipitation of heavy metals with the disposal of heavy metal sludges in an on-site lagoon. During these operations, poor waste handling practices reportedly resulted in multiple spills onto the surface soil at the Site. AICC ceased active waste management operations in 1973. Both contained and uncontained wastes were left in the building and on the grounds at this time.

The Site was placed on the National Priorities List (NPL) in 1982. In 1985, a surface removal of on-site contaminants was conducted by a OH Materials Corp. on behalf of certain PRPs. This was followed by the demolition of the building, performed under the direction of the City of Kalamazoo.

The environmental investigation of the Site has been separated into two parts, called Operable Units. Operable Unit one deals with contaminants entrained in the soils on-site above the water table. The RI for Operable Unit One was conducted during 1987-1988 and the Feasibility Study (FS) was conducted in 1989. The results of the RI/FS for Operable Unit One documents the presence of on-site contaminants and provides remedial alternatives that are applicable for remediating that aspect of the Site.

Operable Unit Two is concerned with the groundwater. The RI for Operable Unit Two was conducted and reported concurrent with the RI for Operable Unit One.

2.0 SUMMARY OF FIELD INVESTIGATION ACTIVITIES

2.1 Introduction

EA's field activities at the Site were conducted on December 6 and 10, 1990. These activities were limited to obtaining groundwater samples from the seven existing monitoring wells, and measuring the static groundwater levels in these same wells (Figure 2-1). The original RI report was approved by the USEPA, therefore eliminating the need for further characterization of other environmental media (i.e., soil and sediment) as part of this work. An extensive site characterization study is contained in the December 1988 RI report.

2.2 Groundwater Elevation Measurement

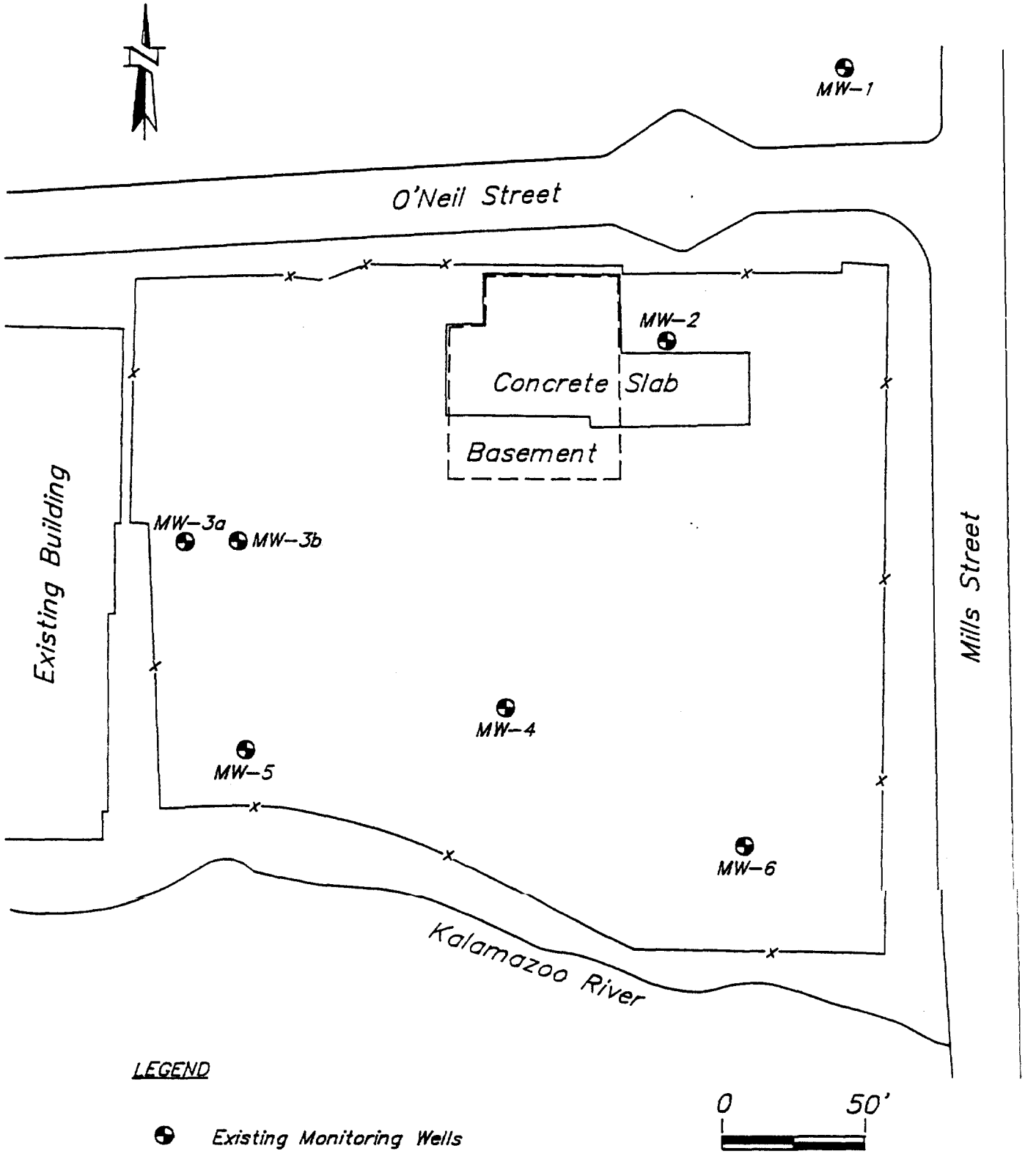
Static water levels were measured in the seven existing monitoring wells on December 6, 1990, and again on December 10, 1990. The monitoring wells were measured using an electronic water level measurement device in accordance with the QAPP.

The elevation of the river was measured on December 10, 1990, at a point directly south of monitoring well W-5. The river level elevation at that same location was estimated on December 6 using the data from the December 10 measurement and river level records obtained for the Comstock Gauging Station, located approximately one mile upstream from the Site.

2.3 Sampling and Analysis of Monitoring Wells

On December 10, 1990, groundwater samples were obtained from the seven existing monitoring wells. The methods used to obtain and analyze these samples are identified in the QAPP. The samples were analyzed by NET's laboratory in Cherry Hill, New Jersey, except for hexavalent chromium which was analyzed by Clayton's

FIGURE 2-1



MONITORING WELL LOCATIONS

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MS68403H

laboratory in Novi, Michigan. The analytical results were obtained in January and February, 1991. Data validation was performed by EA.

3.0 HYDROGEOLOGICAL DATA

3.1 Round III Hydrogeological Data

Static water level measurements were made in all wells on December 6 and 10, 1990. The level of the river was measured at the site on December 10, and was estimated on December 6 by requesting data from the USGS and adding the difference between the recorded elevations for 12/6/90 and 12/10/90. The results of these measurements are provided in Table 3-1.

The measurements made on the December 6 indicate that wells W-2 and W-6 have the highest static water level elevation with a reading of 756.91 feet above mean sea level (MSL). Well W-1, the up-gradient well, was found to have the lowest static water level elevation at 756.75 MSL. The United States Geological Survey (USGS) was contacted for river elevations at Comstock Park gauge corresponding to the approximate time and date groundwater elevations were measured on December 6th - 10th. The difference between the water level elevations over the two days (at Comstock gauge) was added to the surveyed elevation on December 10th to obtain the estimated value for December 6. This estimated level of the Kalamazoo River was 756.28 MSL.

Water level measurements taken on December 10 show that well W-1 had the highest static water level elevation at 756.76 MSL. The static water level in monitoring well W-2 had fallen from 756.91 MSL to 756.16 MSL. Monitoring well W-6 had fallen from 756.91 MSL to 755.89 MSL. The level of the Kalamazoo River was measured, on December 10, at 755.70 MSL, at a point where the river passes the site directly south of well W-5.

These measurements have been used to develop two potentiometric surface maps. The results of December 6, 1990, Table 3-1 measurements were used to develop Figure 3-1 and the

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TABLE 3-1

GROUNDWATER ELEVATIONS
DECEMBER 1990

WELL NO.	GROUND LEVEL	PROTECTIVE CASING	TOP OF RISER	BOTTOM ELEVATION	ELEVATION OF SCREENED INTERVAL	WATER LEVEL 12/06/90	WATER LEVEL 12/10/90
W-1	761.46	764.30	764.10	742.46	755.46 TO 744.76	756.75	756.26
W-2	762.66	765.35	765.13	745.56	756.26 TO 745.56	756.91	756.16
W-3a	762.63	764.60	764.38	745.63	756.33 TO 745.63	756.84	756.06
W-3b	762.51	764.65	764.36	712.01	727.41 TO 716.71	756.89	756.10
W-4	764.11	765.71	765.43	740.11	751.81 TO 741.11	756.84	756.03
W-5	763.36	765.77	765.55	739.36	750.86 TO 740.16	756.88	755.98
W-6	764.06	766.19	765.94	740.06	751.26 TO 741.06	756.91	755.89
STAFF GAUGE		757.22					
RIVER LEVEL						756.28*	755.64

* Estimated Value;

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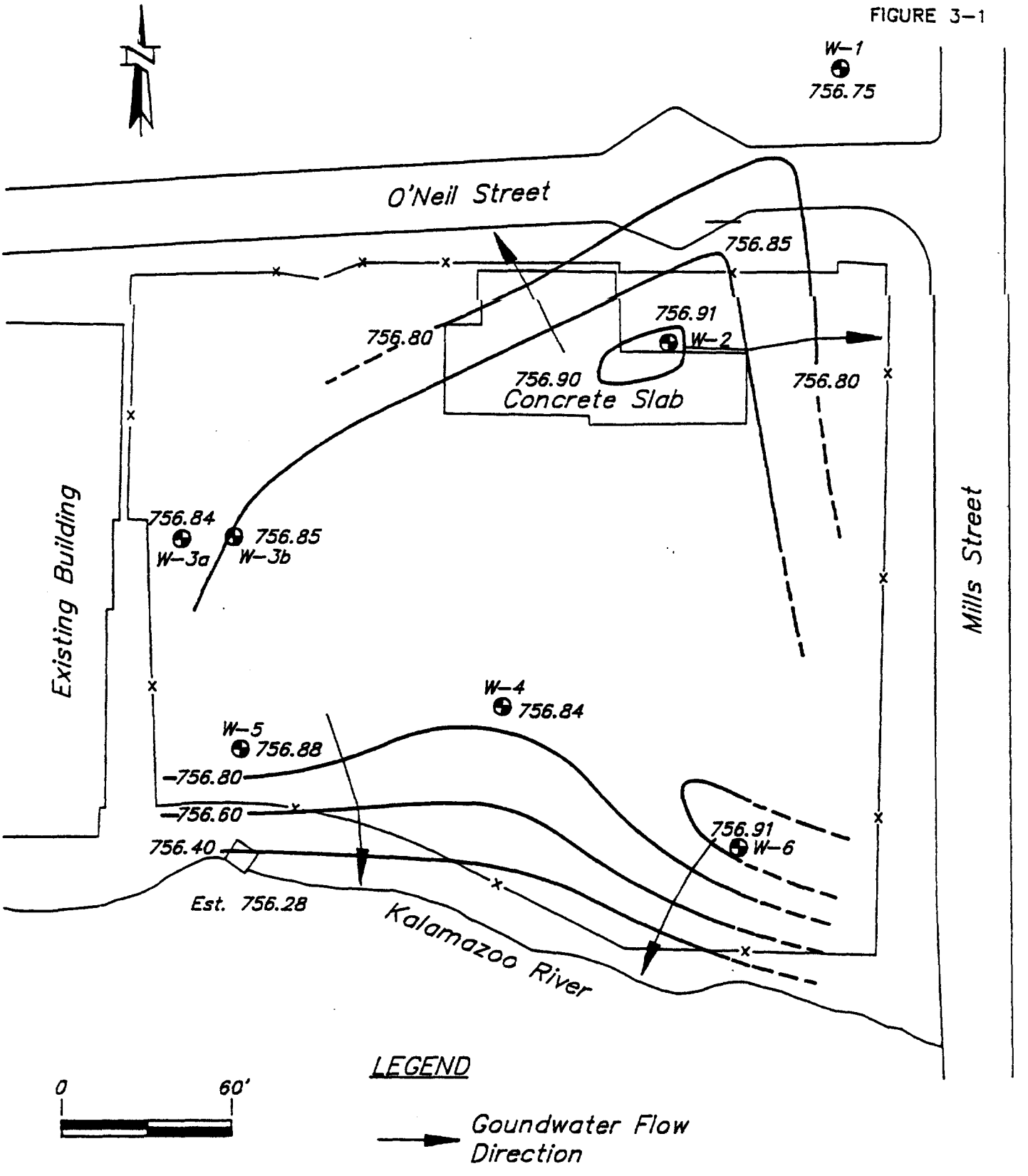
FIGURE 3-1



POTENTIOMETRIC SURFACE MAP
DECEMBER 6, 1990

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KALAMAZOO, MICHIGAN

MS68402D

results from December 10, 1990, were used to develop Figure 3-2. In Figure 3-1 the groundwater appears to mounded below the center of the site, with the groundwater flowing both towards and away from the river.

Figure 3-2 clearly indicates that the direction of groundwater flow is in a southerly direction towards the Kalamazoo River.

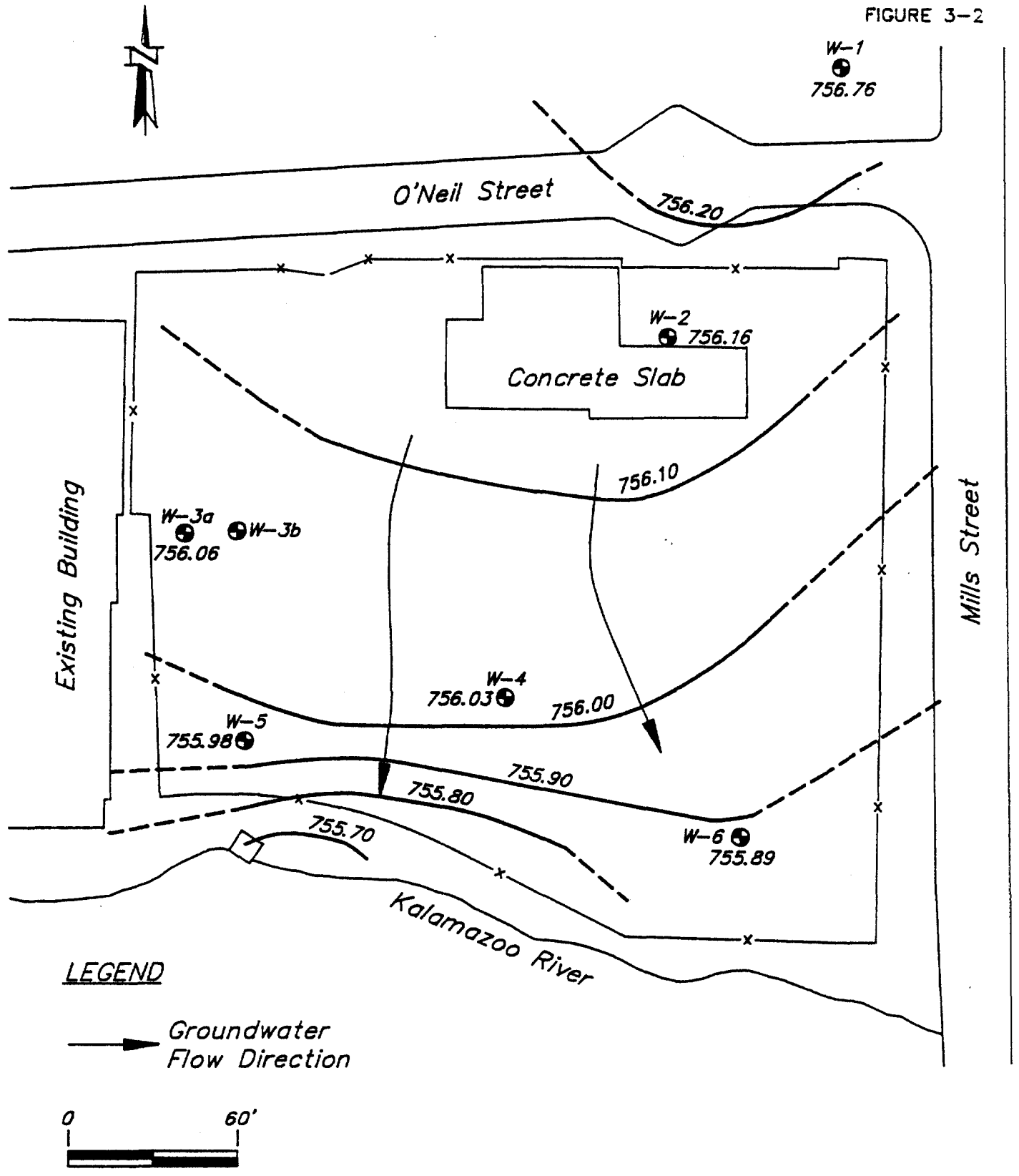
According to the United States Geodetic Survey (USGS) the Kalamazoo River crested, at the Comstock Park gauging station, at approximately 4:00 am on December 2, 1990. The river level at that time was recorded at 7.72 feet by the gauge at the Comstock Station. On December 6, 1990, the Comstock gauge registered a river level of 5.73 feet, a decline of 1.99 feet. On December 10, 1990, the Comstock gauge registered a river level of 5.09 feet, a further decline. This data is provided in Table 3-2.

3.2 Comparison of Round III with previous data

The results of the static water level surveys conducted on December 6 and 10, 1990, along with the five surveys in the December 1988 RI, are provided in Table 3-3. Potentiometric surface maps were developed from these five surveys for the RI, and copies can be found in Figures 3-3 through 3-7.

These maps indicate that the apparent reversals of groundwater flow direction occur in response to the river level fluctuations. This condition is common along the edge of rivers, but usually is a temporary condition that does not extend very far away from the river's edge. The change in water level is caused by both the seepage of river water into the bank and by a response of the saturated zone to the loading caused by the increased weight of the river during high river stages. The latter cause and effect usually causes the initial rise while the infiltration of the river water into the groundwater lags behind.

FIGURE 3-2



POTENTIOMETRIC SURFACE MAP
DECEMBER 10, 1990

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MS68402C

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TABLE 3-2

KALAMAZOO RIVER LEVEL ELEVATIONS'
DECEMBER 1990

DATE	TIME	RIVER (1) LEVEL (FEET)	CHANGE FROM HIGH WATER (FEET)
2	4:00 AM	7.72 (2)	NA
6	11:00 AM	5.73	1.99
10	12:00 AM	5.09	2.63

1) Data from Comstock Gaging Station, Operated by USGS

2) High Water Level

NA Not Applicable

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TABLE 3-3

HYDROLOGICAL ELEVATIONS

WELL NO.	11/03/87*	01/08/88*	02/21/88*	03/07/88*	03/25/88*	12/06/90	12/10/90
W-1	753.87	754.99	755.52	755.22	754.95	756.75	756.26
W-2	753.99	754.59	755.53	755.09	754.84	756.91	756.16
W-3a	752.49	754.55	755.51	754.99	754.81	756.84	756.06
W-3b	752.46	754.45	755.62	754.88	754.82	756.89	756.10
W-4	752.66	754.39	755.62	754.86	754.79	756.84	756.03
W-5	752.86	754.33	755.65	754.83	754.77	756.88	755.98
W-6	753.67	754.32	755.79	754.79	754.73	756.91	755.89
STAFF GAUGE	754.24	753.82	756.28		754.62		
RIVER LEVEL						756.28**	755.64

* Data from RI

** Estimated value;

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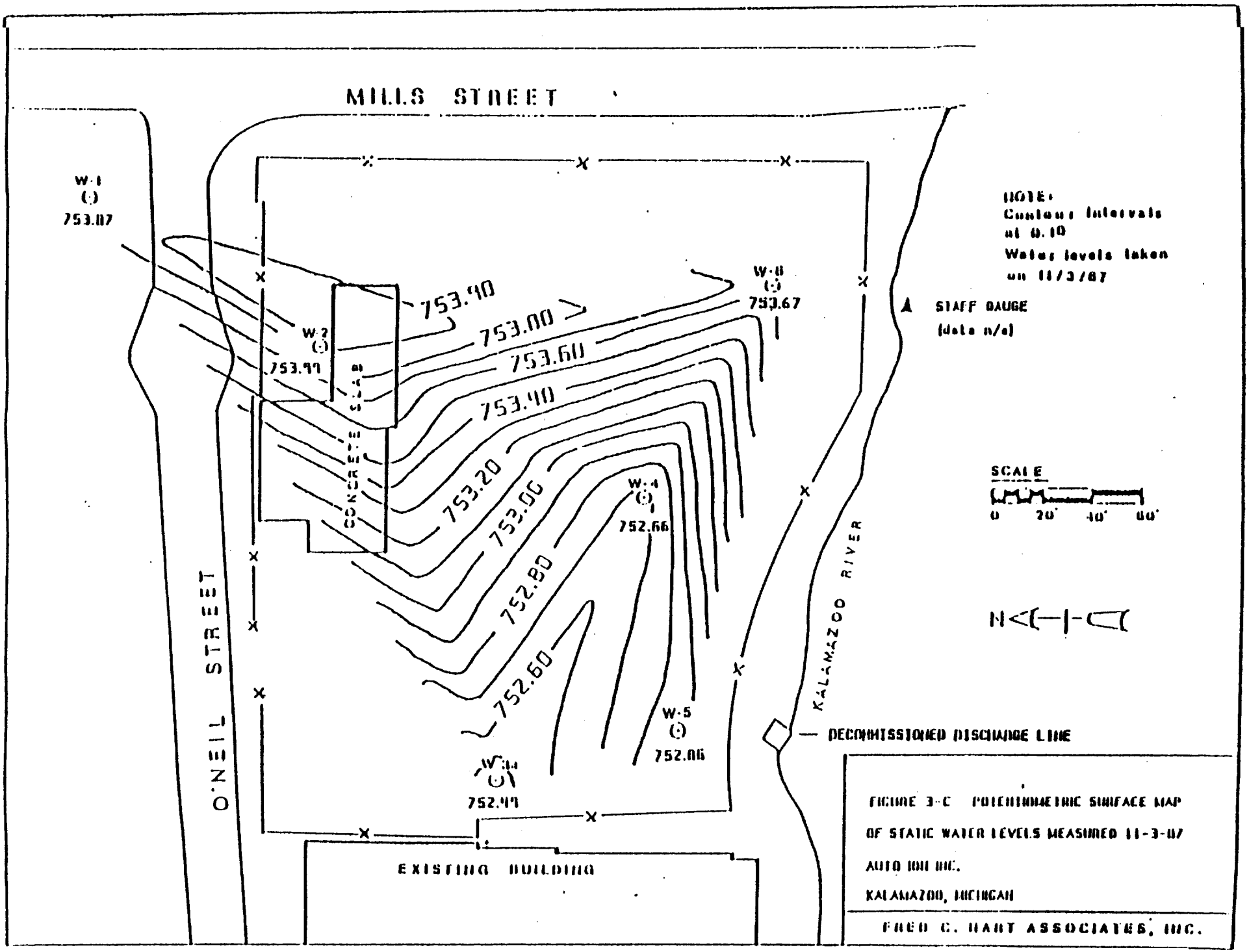
MILLS STREET
O'NEIL STREET
KALAMAZOO RIVER
EXISTING BUILDING
CONCRETE SLAB
W-1
753.87
W-2
753.99
W-3
752.99
W-4
752.66
W-5
752.86
W-8
753.67
753.90
753.00
753.60
753.40
753.20
753.00
752.80
752.60
NOTE:
Contour intervals at 0.10
Water levels taken on 11/3/87
STAFF GAUGE
(data n/a)
SCALE
0 20' 40' 60'
N
DECOMMISSIONED DISCHARGE LINE
FIGURE 3-C POTENTIOMETRIC SURFACE MAP
OF STATIC WATER LEVELS MEASURED 11-3-87
AUTO ION INC.
KALAMAZOO, MICHIGAN
FRED C. HART ASSOCIATES, INC.

FIGURE 3-3

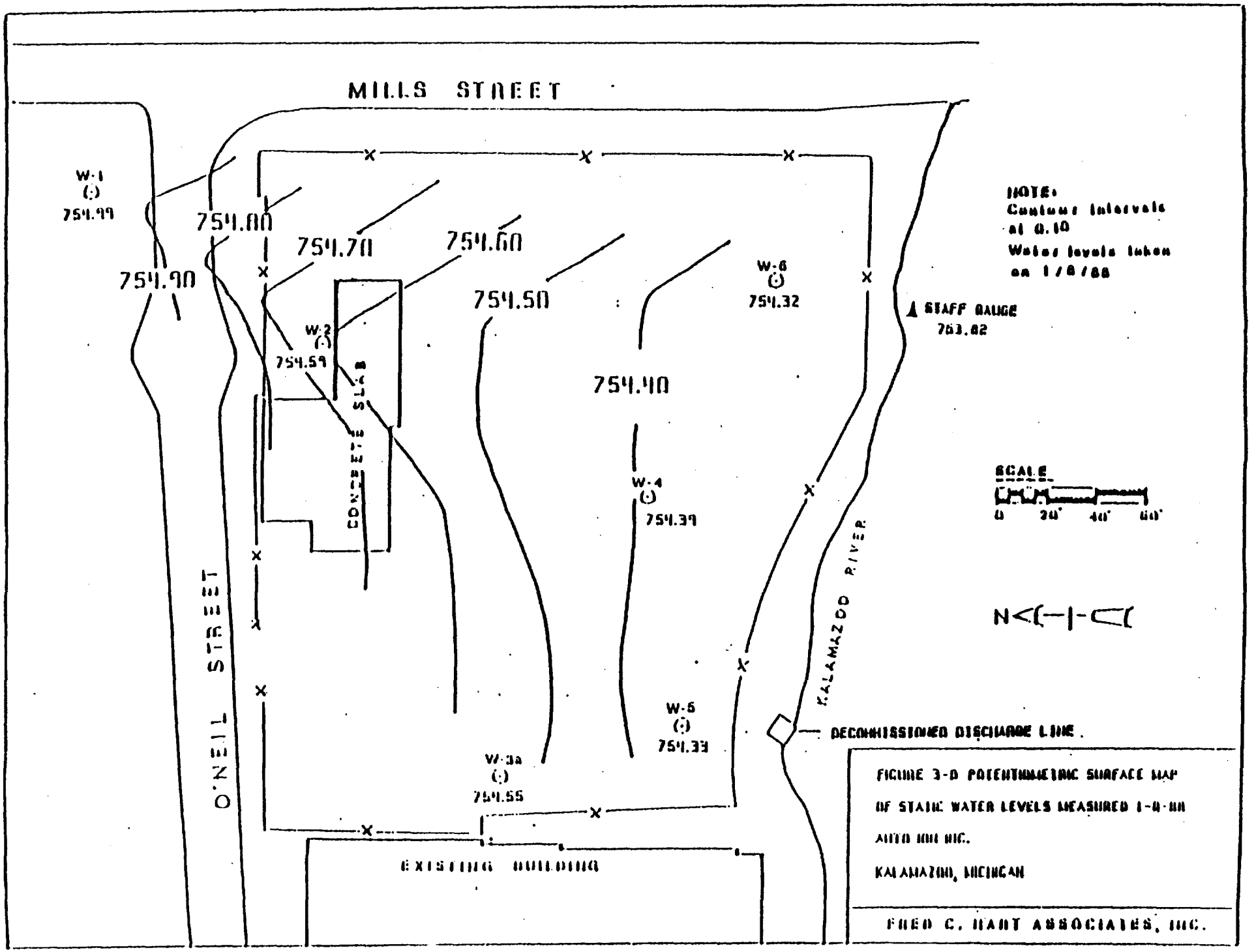
MILLS STREET
O'NEIL STREET
KALAMAZOO RIVER
W-1
754.99
754.80
754.70
754.60
754.90
754.50
W-6
754.32
W-2
754.59
CONCRETE SLAB
754.40
W-4
754.39
W-6
754.33
W-3a
754.55
EXISTING BUILDING
STAFF GAUGE
753.82
NOTE:
Contour intervals at 0.10
Water levels taken on 1/8/88
SCALE
0 20' 40' 60'
DECOMMISSIONED DISCHARGE LINE.
FIGURE 3-8 POTENTIOMETRIC SURFACE MAP
OF STATIC WATER LEVELS MEASURED 1-8-88
AUTO ION INC.
KALAMAZOO, MICHIGAN
FRED C. HART ASSOCIATES, INC.

FIGURE 3-4

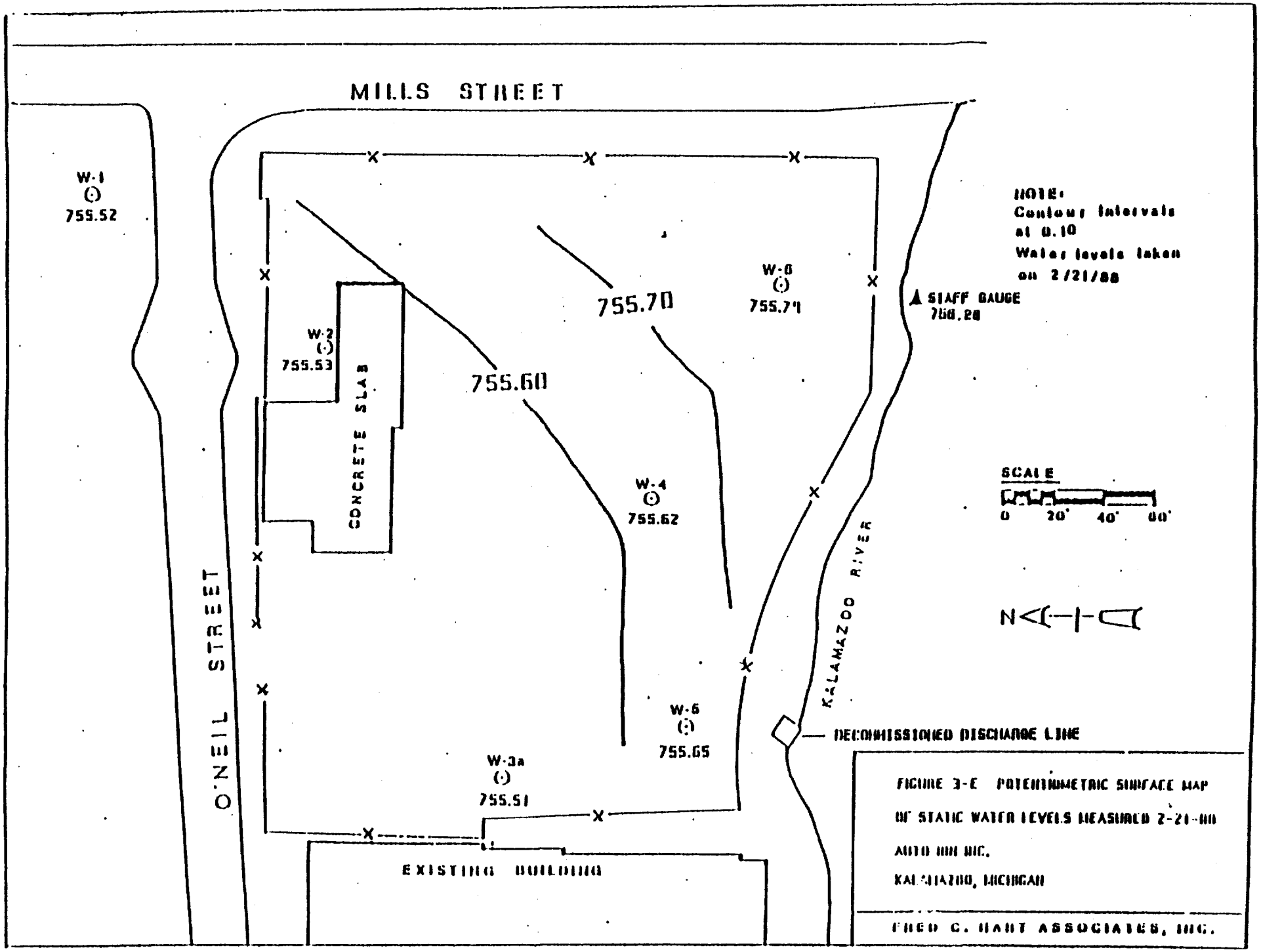
MILLS STREET
O'NEIL STREET
KALAMAZOO RIVER
W-1
755.52
W-2
755.53
W-3a
755.51
W-4
755.62
W-5
755.65
W-6
755.71
755.70
755.60
CONCRETE SLAB
EXISTING BUILDING
DECOMMISSIONED DISCHARGE LINE
STAFF GAUGE
758.28
NOTE:
Contour Intervals
at 0.10
Water levels taken
on 2/21/88
SCALE
0 20' 40' 80'
N
FIGURE 3-E POTENTIOMETRIC SURFACE MAP
OF STATIC WATER LEVELS MEASURED 2-21-88
AUTO ION INC.
KALAMAZOO, MICHIGAN
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FIGURE 3-5

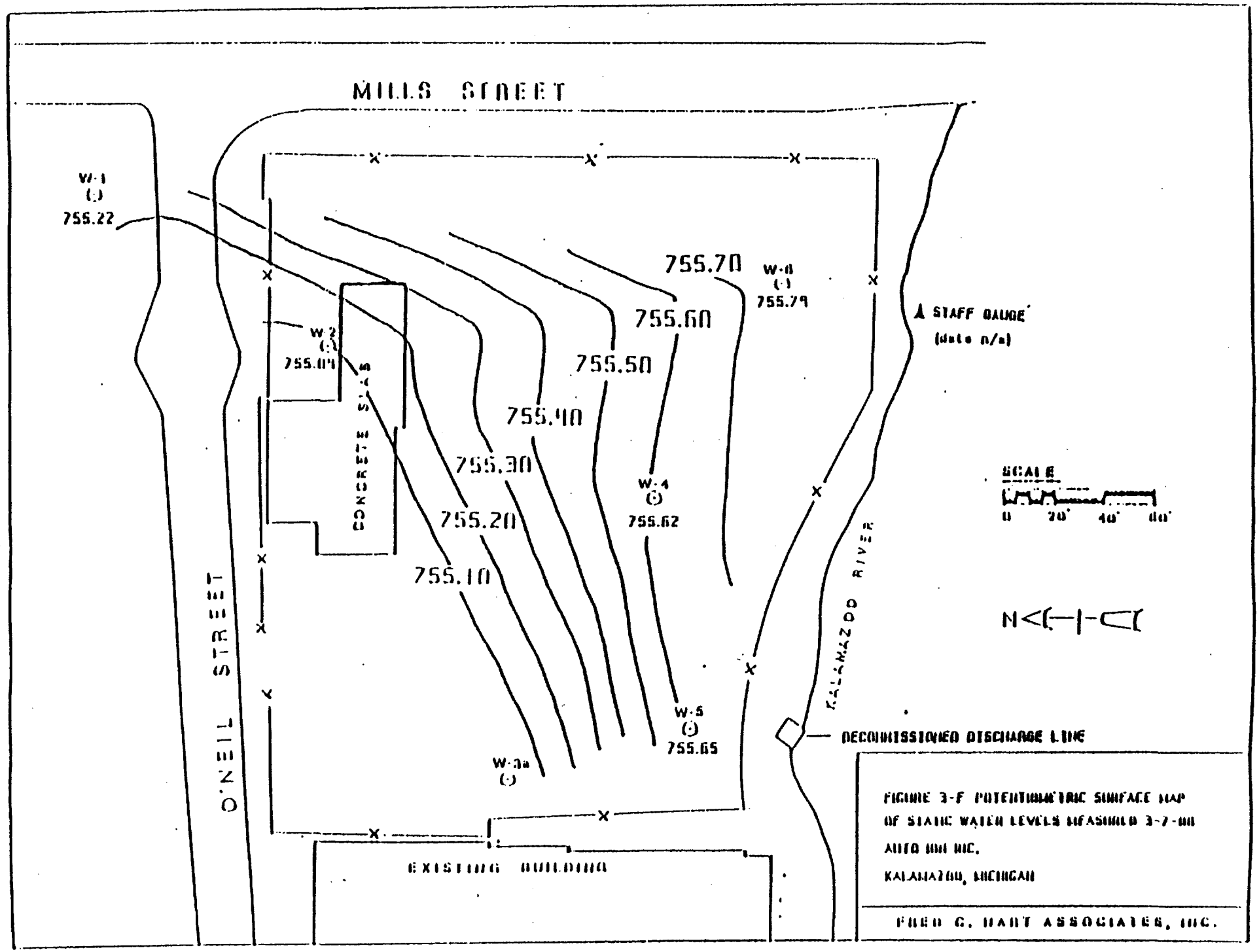
MILLS STREET
O'NEIL STREET
KALAMAZOO RIVER
CONCRETE SLAB
W-1
755.22
W-2
755.09
W-3a
W-4
755.62
W-5
755.65
W-6
755.79
755.70
755.60
755.50
755.40
755.30
755.20
755.10
STAFF GAUGE
(data n/a)
SCALE
0 20 40 60
N
DECOMMISSIONED DISCHARGE LINE
EXISTING BUILDING
FIGURE 3-F POTENTIOMETRIC SURFACE MAP
OF STATIC WATER LEVELS MEASURED 3-7-88
AUTO ION INC.
KALAMAZOO, MICHIGAN
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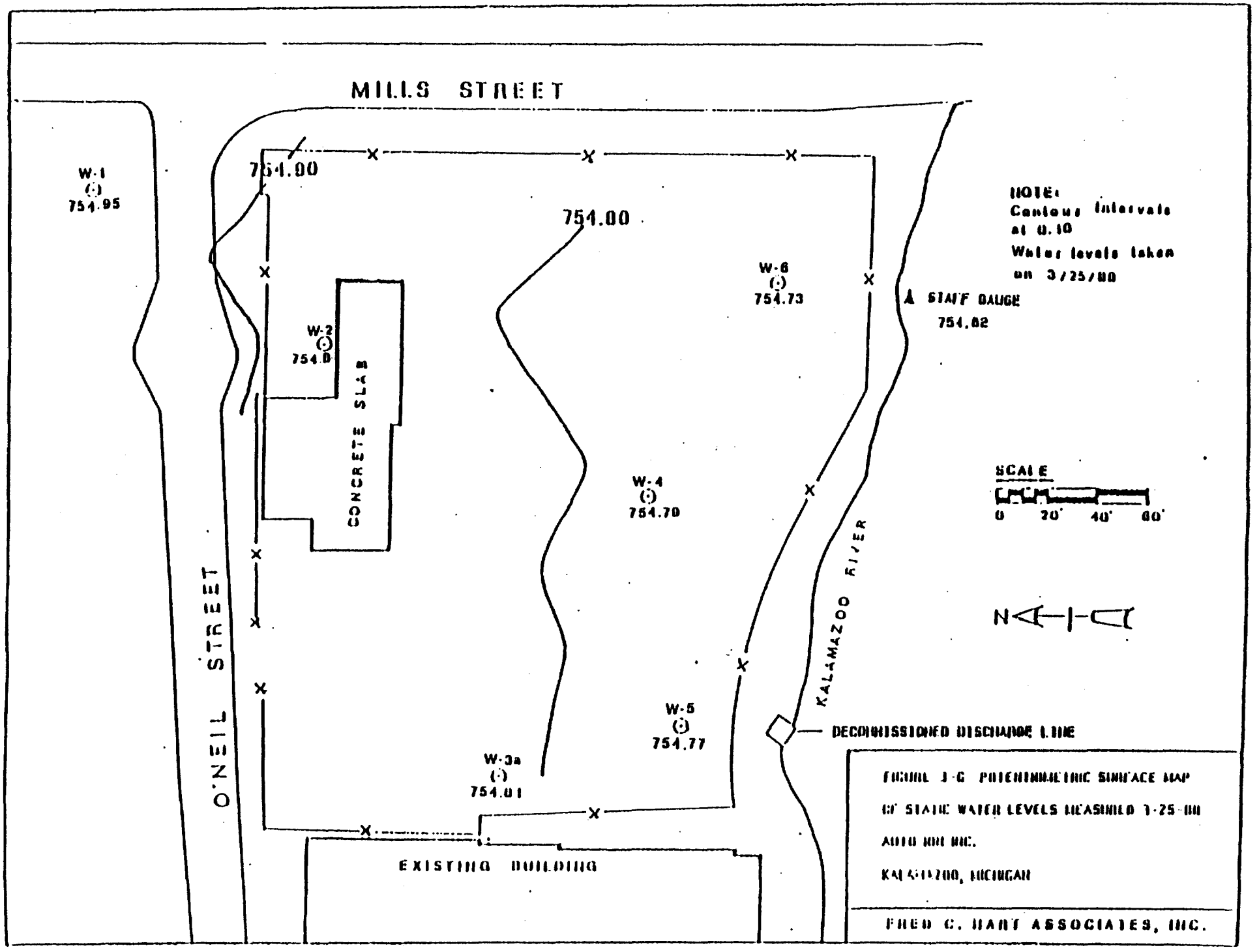
FIGURE 3-6


MILLS STREET
O'NEIL STREET
KALAMAZOO RIVER
754.00
754.00
W-1
754.95
W-2
754.0
W-3a
754.01
W-4
754.70
W-5
754.77
W-6
754.73
CONCRETE SLAB
EXISTING BUILDING
STAFF GAUGE
754.82
NOTE:
Contour Intervals
at 0.10
Water levels taken
on 3/25/88
SCALE
0 20 40 80
N
DECOMMISSIONED DISCHARGE LINE
FIGURE 3-G POTENTIOMETRIC SURFACE MAP
OF STATIC WATER LEVELS MEASURED 3-25-88
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KALAMAZOO, MICHIGAN
FRED C. HART ASSOCIATES, INC.

FIGURE 3–7

This trend is further substantiated by the data obtained on December 6 and 10, 1990. When the river level is high, as on December 2, 1990, the groundwater appears to flow away from the river. When the river is at normal or low levels, as on December 10, 1990, the groundwater appears to flows towards the river. When the river is subsiding, as it was on December 6, 1990, the groundwater flow begins to reverse at the river and slowly work its way across the site. This can result in a potentiometric map, similar to Figures 3-1 and 3-3 , showing the groundwater flowing both away from and towards the river, with a mounded area in between.

4.0 CHEMICAL DATA

4.1 Round III Chemical Data

Groundwater samples were obtained from the seven existing monitoring wells on December 10, 1990. Analytical results of the groundwater samples are provided in Table 4-1, 4-2, and 4-3. The inorganic compounds are shown in Table 4-1, the semi-volatile organic compounds are shown in Table 4-2, and the volatile organic compounds are shown in Table 4-3. The validation summary of the laboratory data is provided in Appendix A.

Aluminum was detected in well MW-5 at a concentration of 205 ppb. Arsenic was detected in a range of values, with a low of 4 ppb in MW-3A to 30 ppb in MW-4. Barium was detected in MW-2 at a concentration of 82 ppb and in MW-6 at 70 ppb. Calcium was found in all wells, ranging in concentration from 132,000 ppb in MW-6 to 323,000 ppb in MW-4. Chromium III was present in MW-2 at 151 ppb and MW-5 at 6 ppb. Chromium VI was detected in four wells with concentrations varying from 220 ppb in MW-2, to 10 ppb in MW-4 and 5. Iron was found in five of the on-site wells, with concentrations ranging from 1,060 ppb in MW-6 to 12,400 ppb in MW-3A. Magnesium was identified in all wells ranging from 27,900 ppb in MW-3A to 139,000 ppb in MW-4. Manganese was also identified in all wells ranging from 115 ppb in MW-1, to 1,170 in MW-3A. Mercury was detected in only one well, MW-3A, at a concentration of 3.4 ppb. Nickel was detected in six wells, from a concentration of 29 ppb in MW-6, to 2,440 ppb in MW-4. Potassium and sodium was found in all wells. Zinc was present in four of the wells, with a high of 103 ppb in MW-4 and a low of 10 ppb in MW-6. Cyanide was detected in MW-3A at 12 ppb, MW-4 at 33 ppb, and MW-5 at 21 ppb.

For the semi-volatile organic compounds, 1,2-Dichlorobenzene was detected in MW-4 at an estimated concentration of 19 ppb. An estimated 2 ppb of 2,4-Dimethylphenol was also discovered in MW-4.

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KALAMAZOO, MICHIGAN

TABLE 4-1

INORGANICS (ppb)
DECEMBER, 1990

COMPOUND	MW1	MW2	MW3A	MW3B	MW3B DUP	MW4	MW5	MW6
Aluminum	U	U	U	U	U	U	205	UJ
Antimony	U	U	U	U	U	U	U	UJ
Arsenic	U	UJ	4J	U	UJ	30J	10	5J
Barium	63U*	82	39U*	49U*	50U*	U	U	70J
Beryllium	U	U	U	U	U	U	U	UJ
Cadmium	U	U	U	U	U	U	U	UJ
Calcium	152,000	151,000	242,000	166,000	166,000	323,000	178,000	132,000J
Chromium III	U	151	U	U	U	U	6	UJ
Chromium VI	U	220	20	U	U	10J	10J	UJ
Cobalt	U	U	U	U	U	U	U	UJ
Copper	U	U	U	U	U	U	U	UJ
Iron	U	U	12,400	1,800	1,880	12,300	6,780	1,060J
Lead	U	U	U	U	U	U	U	UJ
Magnesium	38,800	28,800	27,900	47,700	47,700	139,000	41,800	34,900J
Manganese	115	248	1,170	243	245	743	568	674J
Mercury	U	U	3.4	U	U	U	U	UJ
Nickel	29	281	40	U	U	2,440	881	39J
Potassium	5640	6,600	31,900	3,610	3,700	104,000	22,500	7,040J
Selenium	4UJ*	3UJ*	UJ	UJ	UJ	UR	UJ	UJJ
Silver	U	U	U	U	U	U	U	UJ
Sodium	148,000	122,000	90,100	108,000	108,000	320,000	103,000	103,000J
Thallium	U	U	U	U	U	UJ	U	UJJ
Vanadium	U	U	U	U	U	U	U	UJ
Zinc	U	U	U	16	12	103	57	10J
Cyanide	U	U	12	U	U	33	21	UJ

J - Detection limit is estimated
U - Compound below detection levels
R - Unusable
* - Data negated

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AUTO ION SITE
KALAMAZOO, MICHIGAN

TABLE 4-2

SEMIVOLATILE ORGANICS (ppb)
DECEMBER, 1990

COMPOUND	MW1	MW2	MW3A	MW3B	MW3B DUP	MW4	MW5	MW6
Phenol	U	U	U	UJ	UJ	UJ	UJ	UJ
bis(2-Chloroethyl)ether	U	U	U	UJ	UJ	UJ	UJ	UJ
2-Chlorophenol	U	U	U	UJ	UJ	UJ	UJ	UJ
1,3-Dichlorobenzene	U	U	U	UJ	UJ	UJ	UJ	UJ
1,4-Dichlorobenzene	U	U	U	UJ	UJ	UJ	UJ	UJ
Benzyl alcohol	U	U	U	UJ	UJ	UJ	UJ	UJ
1,2-Dichlorobenzene	U	U	U	UJ	UJ	19J	UJ	UJ
2-Methylphenol	U	U	U	UJ	UJ	UJ	UJ	UJ
bis(2-Chloroisopropyl)ether	U	U	U	UJ	UJ	UJ	UJ	UJ
4-Mehtylphenol	U	U	U	UJ	UJ	UJ	UJ	UJ
N-Nitroso-di-n-propylamine	U	U	U	UJ	UJ	UJ	UJ	UJ
Hexachloroethane	U	U	U	UJ	UJ	UJ	UJ	UJ
Nitrobenzene	U	U	U	UJ	UJ	UJ	UJ	UJ
Isophorone	U	U	U	UJ	UJ	UJ	UJ	UJ
2-Nitrophenol	U	U	U	UJ	UJ	UJ	UJ	UJ
2,4-Dimethylphenol	U	U	U	UJ	UJ	2J	UJ	UJ
Benzoic acid	U	U	U	UJ	UJ	UJ	UJ	UJ
bis(2-chloroethoxy)methane	U	U	U	UJ	UJ	UJ	UJ	UJ
2,4-Dichlorophenol	U	U	U	UJ	UJ	UJ	UJ	UJ
1,2,4-Trichlorobenzene	U	U	U	UJ	UJ	UJ	UJ	UJ
Naphthalene	U	U	U	UJ	UJ	UJ	UJ	UJ
4-Chloroaniline	U	U	U	UJ	UJ	UJ	UJ	UJ
Hexachlorobutadiene	U	U	U	UJ	UJ	UJ	UJ	UJ
4-Chloro-3-methylphenol	U	U	U	UJ	UJ	UJ	UJ	UJ
2-Methylnaphthalene	U	U	U	UJ	UJ	UJ	UJ	UJ
Hexachlorocyclopentadie	U	U	U	UJ	UJ	UJ	UJ	UJ
4-Chloro-3-methylphenol	U	U	U	UJ	UJ	UJ	UJ	UJ
2-Methylnaphthalene	U	U	U	UJ	UJ	UJ	UJ	UJ
Hexachlorocyclopentadiene	U	U	U	UJ	UJ	UJ	UJ	UJ
2,4,6-Trichlorophenol	U	U	U	UJ	UJ	UJ	UJ	UJ
2,4,5-Trichlorophenol	U	U	U	UJ	UJ	UJ	UJ	UJ
2-Chloronaphthalene	U	U	U	UJ	UJ	UJ	UJ	UJ
2-Nitroaniline	U	U	U	UJ	UJ	UJ	UJ	UJ
Diemthylphthalate	U	U	U	UJ	UJ	UJ	UJ	UJ
Acenaphthylene	U	U	U	UJ	UJ	UJ	UJ	UJ
2,6-Dinitrotoluene	U	U	U	UJ	UJ	UJ	UJ	UJ

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TABLE 4-2 (Continued)

SEMIVOLATILE ORGANICS (ppb)
DECEMBER, 1990

COMPOUND	MW1	MW2	MW3A	MW3B	MW3B DUP	MW4	MW5	MW6
3-Nitroaniline	U	U	U	UJ	UJ	UJ	UJ	UJ
Acenaphthene	U	U	U	UJ	UJ	UJ	UJ	UJ
2,4-Dinitrophenol	U	U	U	UJ	UJ	UJ	UJ	UJ
4-Nitrophenol	U	U	U	UJ	UJ	UJ	UJ	UJ
Dibenzofuran	U	U	U	UJ	UJ	UJ	UJ	UJ
2,4-Dinitrotoluene	U	U	U	UJ	UJ	UJ	UJ	UJ
Diethylphthalate	U	U	U	UJ	UJ	UJ	UJ	UJ
4-Chlorophenly-phenylether	U	U	U	UJ	UJ	UJ	UJ	UJ
Fluorene	U	U	U	UJ	UJ	UJ	UJ	UJ
4-Nitroaniline	U	U	U	UJ	UJ	UJ	UJ	UJ
4,6-Dinitro-2-methylphenol	U	U	U	UJ	UJ	UJ	UJ	UJ
N-Nitrosodiphenylamine(1)	U	U	U	UJ	UJ	UJ	UJ	UJ
4-Bromophenyl-phenylether	U	U	U	UJ	UJ	UJ	UJ	UJ
Hexachlorobenzene	U	U	U	UJ	UJ	UJ	UJ	UJ
Pentachlorophenol	U	U	U	UJ	UJ	UJ	UJ	UJ
Phenanthrene	U	U	U	UJ	UJ	UJ	UJ	UJ
Anthracene	U	U	U	UJ	UJ	UJ	UJ	UJ
Di-n-butylphthalate	U	U	U	UJ	UJ	UJ	UJ	UJ
Flouranthene	U	U	U	UJ	UJ	UJ	UJ	UJ
Pyrene	U	U	U	UJ	UJ	UJ	UJ	UJ
Butylbanzylphthalate	U	U	U	UJ	UJ	UJ	UJ	UJ
3,3-Dichlorobenzidine	U	U	U	UJ	UJ	UJ	UJ	UJ
Benzo(a)anthracene	U	U	U	UJ	UJ	UJ	UJ	UJ
Chrysene	U	U	U	UJ	UJ	UJ	UJ	UJ
bis(2-Ethylhexyl)phthalate	U	U	43B*	UJ	UJ	UJ	UJ	UJ
Di-n-octylphthalate	U	U	U	UJ	UJ	UJ	UJ	UJ
Benzo(b)flouranthene	U	U	U	UJ	UJ	UJ	UJ	UJ
Benzo(k)flouranthene	U	U	U	UJ	UJ	UJ	UJ	UJ
Benzo(a)pyrene	U	U	U	UJ	UJ	UJ	UJ	UJ
Indeno(1,2,3-cd)pyrene	U	U	U	UJ	UJ	UJ	UJ	UJ
Dibenz(a,h)anthracene	U	U	U	UJ	UJ	UJ	UJ	UJ
Benzo(g,h,i)perylene	U	U	U	UJ	UJ	UJ	UJ	UJ

U - Compound below detection limits
J - Estimated Value
B - Compound detected in blank
* - Data negated

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TABLE 4-3

VOLATILE ORGANICS (ppb)
DECEMBER, 1990

COMPOUND	MW1	MW2	MW3A	MW3B	MW3B DUP	MW4	MW5	MW6
Chloromethane	U	U	U	U	U	38J	U	12J
Bromomethane	U	U	U	U	U	U	U	UJ
Vinyl Chloride	U	U	U	U	U	48J	U	UJ
Chloroethane	U	U	U	U	U	U	U	UJ
Methylene Chlooride	U	U	U	U	U	U	U	UJ
Acetone	U	U	U	U	U	U	U	UJ
Carbon Disulfide	U	U	U	U	U	U	U	UJ
1,1-Dichloroethene	U	U	U	U	U	U	U	UJ
1,1-Dichloroethane	U	U	U	U	U	U	U	UJ
1,2-Dichloroethene (total)	U	U	31	U	U	180	10	UJ
Chloroform	U	6	U	U	U	U	U	UJ
1,2-Dichloroethane	U	U	U	U	U	U	U	UJ
2-Butanone	U	U	U	U	U	U	U	UJ
1,1,1-Trichloroethane	U	U	U	U	U	U	U	UJ
Carbon Tetrachloride	U	U	U	U	U	U	U	UJ
Vinly Acetate	U	U	U	U	U	U	U	UJ
Bromodichloromethane	U	U	U	U	U	U	U	UJ
1,2-Dichloropropane	U	U	U	U	U	U	U	UJ
cis-1,3-Dichloropropene	U	U	U	U	U	U	U	UJ
Trichloroethene	U	U	U	U	U	160	U	UJ
Dibromochloromethane	U	U	U	U	U	U	U	UJ
1,1,2-Trichloroethane	U	U	U	U	U	U	U	UJ
Benzene	U	U	U	U	U	U	U	UJ
Trans-1,3-Dichloropropene	U	U	U	U	U	U	U	UJ
Bromoform	U	U	U	U	U	U	U	UJ
4-Methyl-2-Pentonone	U	U	U	U	U	U	U	UJ
2-Hexanone	U	U	U	U	U	U	U	UJ
Tetrachloroethene	9	U	U	U	U	U	U	UJ
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	UJ
Toluene	U	U	U	U	U	U	U	UJ
Chlorobenzene	U	U	U	U	U	U	U	UJ
Ethylbenzene	U	U	4J	U	U	U	U	UJ
Styrene	U	U	U	U	U	U	U	UJ
Xylene (total)	U	U	U	U	U	U	U	UJ

J: estimated value
U: compound below detection limits

Bis(2-Ethylhexyl)phthalate was detected in MW-3A at a concentration of 43 ppb. However, this compound was also discovered in the corresponding method blank, causing this value to be rejected during data validation.

Chloromethane, a volatile organic compound, was detected in MW-4 at a concentration of 38 ppb and in MW-6 at 12 ppb. Vinyl Chloride was found in only one well, MW-4, with a concentration of 48 ppb. Samples from three wells were found to contain Total 1,2-Dichloroethene, with concentrations ranging from 10 ppb in MW-5 to 180 ppb in MW-4. Chloroform was found in MW-2 at a level of 6 ppb. Trichloroethene was detected in MW-4 at a concentration of 160 ppb. Tetrachloroethene was found in MW-1 at a concentration of 9 ppb. Ethylbenzene was discovered in MW-3A at a concentration of 4 ppb.

The data for this third round of groundwater samples from the five shallow wells on-site is summarized in Table 4-4. To be consistent with the RI, MW-3B and MW-1 have been excluded from this summary table. The mean for round III has been calculated using the detection level for those compounds listed as BDL. It appears that the sample means for rounds I and II were calculated without non-detectable samples being considered; this results in lower sample mean concentrations for round III data. MW-3B is a deep well which is screened below a confining layer and MW-1 is considered the up-gradient well.

Trivalent Chromium was positively identified in two samples with a high value of 151 ug/l and a mean sample value of 35 ug/l. The mean concentration is below the primary drinking water standard for Total Chromium of 100 ug/l. Iron was positively identified in four samples with a high value of 12,400 ug/l and a sample mean of 6,514 ug/l. This mean sample value exceeds the Secondary Drinking Water Standard of 300 ug/l. The Secondary Drinking Water Standards are not health based standards, but only aesthetic standards for drinking water. Manganese was positively identified in all five

Tab44.wk1

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TABLE 4-4

SUMMARY OF ANALYTICAL RESULTS OF GROUNDWATER SAMPLES (MG/L) - ROUND III
On-Site Shallow Monitoring Wells

	ROUND III				
PARAMETER	NUMBER OF SAMPLES	NUMBER POSITIVE IDs	Sample Range LOW	HIGH	Sample Mean
Inorganics					
Aluminum	5	1	BDL --	.205	.0698
Arsenic	5	4	BDL --	.030	.0106
Barium	4	2	BDL --	.082	0.034
Beryllium	5	***** ALL SAMPLES WERE BDL *****			
Cadmium	5	***** ALL SAMPLES WERE BDL *****			
Chromium III	5	2	BDL --	.151	.035
Chromium VI	5	4	BDL --	0.22	0.054
Cobalt	5	***** ALL SAMPLES WERE BDL *****			
Copper	5	***** ALL SAMPLES WERE BDL *****			
Cyanide	5	3	BDL --	.033	.0172
Iron	5	4	BDL --	12.40	6.5142
Lead	5	***** ALL SAMPLES WERE BDL *****			
Magnesium	5	5	27.9 --	139	54.48
Manganese	5	5	.248 --	1.17	.6806
Mercury	5	1	BDL --	.0034	.00084
Nickel	5	5	.04 --	2.44	.7362
Silver	5	***** ALL SAMPLES WERE BDL *****			
Vanadium	5	***** ALL SAMPLES WERE BDL *****			
Zinc	5	3	BDL --	.103	.0376
Organics					
Chloroform	5	1	BDL --	.006	.0052
Trichloroethene	5	1	BDL --	.160	.036
Tetrachloroethene	5	***** ALL SAMPLES WERE BDL *****			
*Trans-1,2-Dichloroethene	5	3	BDL --	.180	.0462
1,2-Dichloroethane	5	***** ALL SAMPLES WERE BDL *****			
1,2-Dichlorobenzene	5	1	BDL --	.019	.0118
2,4,6-Trichlorophenol	5	***** ALL SAMPLES WERE BDL *****			
Vinyl Chloride	5	1	BDL --	.048	.0176
Methylene Chloride	5	***** ALL SAMPLES WERE BDL *****			
Bis(2-ethylhexyl)phthalate	5	DATA NEGATED DURING QA/QC			
Di-n-butylphthalate	5	***** ALL SAMPLES WERE BDL *****			
Diethyl phthalate	5	***** ALL SAMPLES WERE BDL *****			
**Chloromethane	5	2	BDL --	.038	.016
**2,4-Dimethylphenol	5	1	BDL --	.002	.0084

* Reported as Total 1,2-Dichloroethene

** Newly Detected Compound

samples with a high value of 1,170 ug/l and a sample mean of 681 ug/l. This mean sample value exceeds the Secondary Drinking Water Standard of 50 ug/l. Nickel was positively identified in all five samples with a high value of 2,440 ug/l and a sample mean of 863 ug/l. This mean value exceeds the primary drinking water standard of 100 ug/l. Arsenic was positively identified in 4 of the samples with a high value of 30 ug/l and a mean sample value of 10.6 ug/l. This mean sample value is below the primary drinking water standard of 50 ug/l. The Round III inorganic data for the five on-site shallow wells is compared to the Maximum Contaminant Level (MCL) found for each parameter in the National Primary Drinking Water Standard on Table 4-5.

Trichloroethylene was positively identified in one well at a concentration of 160 ug/l, resulting in a mean sample value of 36 ug/l. This level exceeds the primary drinking water standard of 5 ug/l. Vinyl Chloride was positively identified in one well at a concentration 48 ug/l, resulting in a mean sample value of 17.6 ug/l. This level exceeds the primary drinking water standard of 2 ugl. The Round III organic data for the five on-site shallow wells is compared to MCL concentrations on Table 4-6.

4.2 Comparison of Round III with previous data

The analytical data obtained from the three rounds of groundwater samples obtained from the five shallow on-site wells are summarized in Table 4-7. All but one of the inorganic compounds were found in lower concentrations during Round III. Aluminum dropped from a sample mean in Round I of 38.20 mg/l, to a sample mean of 0.0698 mg/l in Round III. Cadmium was found to be below detectable levels (BDL) in Round III, after being positively identified in both Rounds I and II. The concentration of Tri-valent Chromium dropped by a factor of ten in Round III. Chromium VI, which was not detected in Round I and was detected in only one well in Round II, was detected in four wells in Round III.

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TABLE 4-5

ROUND III INORGANIC MEAN SAMPLE DATA
DECEMBER 1990

INORGANIC ELEMENTS	(1) MCL (ug/L)	MEAN SAMPLE VALUE (ug/l)
Aluminum	50-200(2)	69.8
Arsenic	50	10.6
Barium	5,000	41
Beryllium	1	BDL
Cadmium	5	BDL
Calcium	NA	-
Chromium (III)	Total=100	35
Chromium (VI)	NA	53.2
Cobalt	NA	BDL
Copper	1300	BDL
Cyanide	200	17.2
Iron	300(2)	6514.2
Lead	5	BDL
Magnesium	NA	54,480
Manganese	50 (2)	680.6
Mercury	2	.84
Nickel	100	736.2
Silver	50	BDL
Vanadium	NA	BDL
Zinc	5000(2)	37.6

BDL - Below Detection Limits
NA - Information Not Available
(1) MCL National Primary Drinking Water Regulations/ Safe Drinking Water Act
(2) Secondary Drinking Water Standard
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TABLE 4-6

ROUND III ORGANIC MEAN SAMPLE DATA
DECEMBER 1990

ORGANIC COMPOUND	(1) MCL (ug/l)	MEAN SAMPLE VALUES (ug/l)
1,2 Dichlorobenzene	600	11.8
Trans-1,2-Dichloro-ethene (2)	100	46.2
1,2-Dichloroethane	5	BDL
Chloroform	100	5.2
Tetrachloroethene	5	BDL
Trichloroethylene	5	36
Methylene chloride	5	BDL
Vinyl chloride	2	17.6
2,4,6-Trichlorophenol	NA	BDL
Bis(2-ethylhexyl)-phthalate	4	(3)
Diethyl Phthalate	NA	BDL
Di-n-butylphthalate	NA	BDL
Chloromethane (4)	NA	16
2,4-Dimethylphenol (4)	NA	8.4

BDL - Below Detection Limits
NA - Information Not Available
(1) - MCL National Primary Drinking Water Regulations/ Safe Drinking Water Act
(2) - Reported as total 1,2-Dichloroethene
(3) - Data negated during QA/QC
(4) - Newly detected compound

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TABLE 4-7

SUMMARY OF ANALYTICAL RESULTS OF GROUNDWATER SAMPLES (mg/l)
On-Site Shallow Monitoring Wells

PARAMETER	ROUND I			ROUND II			ROUND III		
	NUMBER POSITIVE IDs	HIGHEST LEVEL	SAMPLE MEAN	NUMBER POSITIVE IDs	HIGHEST LEVEL	SAMPLE MEAN	NUMBER POSITIVE IDs	HIGHEST LEVEL	SAMPLE MEAN
Inorganics									
Aluminum	3	74.60	38.20	5	71.70	26.04	1	.205	.0698
Arsenic	3	0.05	0.03	5	0.04	0.03	4	.030	.0106
Barium	2	4.34	2.53	2	4.52	2.63	3	.082	.0406
Beryllium	2	0.11	0.06	***** ALL SAMPLES WERE BDL *****			***** ALL SAMPLES WERE BDL *****		
Cadmium	3	0.04	0.02	5	0.02	0.01	***** ALL SAMPLES WERE BDL *****		
Chromium III	3	1.31	0.78	5	1.37	0.78	2	.151	.035
Chromium VI	***** ALL SAMPLES WERE BDL *****			1	0.13	0.13	4	0.220	0.054
Cobalt	2	0.31	0.19	2	0.13	0.09	***** ALL SAMPLES WERE BDL *****		
Copper	2	0.64	0.56	2	1.16	0.85	***** ALL SAMPLES WERE BDL *****		
Cyanide	5	2.78	0.60	4	0.12	0.07	3	.033	.0172
Iron	3	114.00	53.52	5	278.00	68.96	4	12.40	6.5142
Lead	2	0.57	0.48	5	0.24	0.13	***** ALL SAMPLES WERE BDL *****		
Magnesium	5	209.00	74.52	5	100.00	138.00	5	139	54.48
Manganese	4	11.20	3.81	5	38.2	9.7	5	1.170	.6806
Mercury	2	0.0015	0.0012	3	0.0027	0.0014	1	.0034	.000820
Nickel	5	5.23	2.54	5	12.30	5.73	5	2.44	.8632
Silver	1	0.01	0.01	***** ALL SAMPLES WERE BDL *****			***** ALL SAMPLES WERE BDL *****		
Vanadium	1	0.06	0.06	4	0.18	0.08	***** ALL SAMPLES WERE BDL *****		
Zinc	4	0.86	0.47	5	4.91	1.67	3	0.103	.0376
Organics									
Chloroform	2	0.09	0.05	2	0.03	0.02	1	.006	.0052
Trichloroethene	4	0.41	0.13	2	0.16	0.12	1	.160	.036
Tetrachloroethene	***** ALL SAMPLES WERE BDL *****			***** ALL SAMPLES WERE BDL *****			***** ALL SAMPLES WERE BDL *****		
*Trans-1,2-Dichloroethene	2	0.17	0.13	2	0.12	0.068	3	.180	.0462
1,2-Dichloroethane	1	0.05	0.05	***** ALL SAMPLES WERE BDL *****			***** ALL SAMPLES WERE BDL *****		
1,2-Dichlorobenzene	1	0.02	0.02	***** ALL SAMPLES WERE BDL *****			1	.019	.0118
2,4,6-Trichlorophenol	1	0.02	0.02	***** ALL SAMPLES WERE BDL *****			***** ALL SAMPLES WERE BDL *****		
Vinyl Chloride	3	0.04	0.02	***** ALL SAMPLES WERE BDL *****			1	.048	.0176
Methylene Chloride	3	0.56	0.19	***** ALL SAMPLES WERE BDL *****			***** ALL SAMPLES WERE BDL *****		
Bis(2-ethylhexyl)phthalate	5	0.16	0.06	***** ALL SAMPLES WERE BDL *****			***** ALL SAMPLES WERE BDL *****		
Di-n-butylphthalate	3	0.14	0.11	***** ALL SAMPLES WERE BDL *****			***** ALL SAMPLES WERE BDL *****		
Diethyl phthalate	***** ALL SAMPLES WERE BDL *****			1	.022	.022	***** ALL SAMPLES WERE BDL *****		
**Chloromethane							2	.038	.016
**2,4-Dimethylphenol							1	.002	.0084

* Reported as total 1,2-Dichloroethene

** Newly detected compound

However, the concentration of chromium VI decreased from 0.13 mg/l during Round II to 0.053 mg/l in Round III. Manganese increased in concentration with a level of 0.01 mg/l in Round II to a level of 0.6806 mg/l in Round III.

Of the organic compounds, all but two decreased in concentration from Round II to Round III. The sample mean for all of the organic compounds was lower for Round III than Round I. However, chloromethane and 2,4-Dimethylphenol were detected in Round III samples and not during prior sampling events. The groundwater sampling data results from all three sampling rounds is presented in Table 4-8.

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TABLE 4-8

RESULTS OF GROUNDWATER ANALYSES (µg/l)
INORGANIC ANALYTES

	MW-1			MW-2			MW-3A			MW-3B		
Date	(a) 11/87	3/88	12/90	(a) 11/87	3/88	12/90	(a) 11/87	(b) 3/88	12/90	(a) 11/87	3/88	(b) 12/90
Aluminum	<200	38,600	<200	74,600	71,700	<200	<200	5,320/7,130	<200	<200	<200	<200/<200
Antimony	R	<60	<60	R	<60	<60	R	<60/<60	<60	R	<60	<60/<60
Arsenic	<10	R	<10	31	11	<10	<10	19/21	<10	<10	R	<10/<10
Barium	<200	384	<200	4,340	4,520	<200	<200	<200/<200	<200	<200	<200	<200/<200
Beryllium	<5	<5	<5	111	<5	<5	<5	<5/<5	<5	<5	<5	<5/<5
Cadmium	<5	13	<5	39	23	<5	<5	<5/5.3	<5	<5	<5	<5/<5
Calcium	156,000	427,000	152,000	961,000	488,000	151,000	304,000	328,000/335,000	242,000	149,000	153,000	166,000/166,000
Chromium (total)	<10	277	<10	1,000	599	371	<10	748/902	20	<10	19	<10/<10
Chromium (Hex.)	<10	<10	<10	<10	130	220	<10	<10/<10	20	<10	<10	<10/<10
Cobalt	<50	71	<50	312	125	<50	<50	<50/<50	<50	<50	<50	<50/<50
Copper	<25	R	<25	473	R	<25	<25	492/606	<25	<25	<25	<25/<25
Cyanide	<10	<10	<10	62	<10	<10	129	110/130	12	13	<10	<10/<10
Iron	<100	220,000	<100	46,200	278,000	<100	348	36,300/40,000	12,400	<100	2,050	1,800/1,880
Lead	<5	200	<5	568	230	<5	<5	45/57	<5	<5	8	<5/<5
Magnesium	41,800	117,000	38,800	245,000	138,000	28,800	24,300	32,900/38,200	27,900	47,200	46,300	47,700/47,700
Manganese	16	5,370	115	1,380	38,200	248	1,270	1,520/1,760	1,170	255	234	243/245
Mercury	<0.2	0.30	<0.2	1.5	<0.2	<0.2	<0.2	1.0/1.3	3.4	<0.2	<0.2	<0.2/<0.2
Nickel	<40	225	<40	3,630	12,300	281	270	1,620/1,770	40	211	<40	<40/<40
Potassium	5,720	8,310	5,640	11,100	12,000	6,600	20,100	26,000/28,600	31,900	5,000	5,000	<5,000/<5,000
Selenium	R	R	<5	R	R	<5	R	R/R	<5	R	R	<5/<5
Silver	<10	<10	<10	11	<10	<10	<10	<10/<10	<10	<10	<10	<10/<10
Sodium	163,000	140,000	148,000	133,000	106,000	122,000	66,800	66,800/77,200	90,100	80,300	74,700	108,000/108,000
Thallium	<10	<10	<10	<10	<10	<10	<10	<10/<10	<10	<10	<10	<10/<10
Vanadium	<50	108	<50	<50	178	<50	<50	<50/<50	<50	<50	<50	<50/<50
Zinc	<20	521	<20	855	640	<20	27	1,110/1,280	<20	32	<20	<20/<20

R - Unusable Data
(a) - Unfiltered Samples
(b) - Duplicates

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AUTO ION SITE
KALAMAZOO, MICHIGAN

TABLE 4-8 (Continued)

RESULTS OF GROUNDWATER ANALYSES (µg/l)
INORGANIC ANALYTES

	MW-4			MW-5			MW-6		
Date	(a,b) 11/87	3/88	12/90	(a) 11/87	3/88	12/90	(a) 11/87	3/88	12/90
Aluminum	<200/13,800	4,680	<200	<200	11,000	205	33,100	36,600	<200
Antimony	R/R	<60	<60	R	<60	<60	R	<60	<60
Arsenic	12/33	24	30	<10	44	10	47	27	<10
Barium	<200/<200	<200	<200	<200	<200	<200	720	746	<200
Beryllium	<5/<5	<5	<5	<5	<5	<5	6.5	<5	<5
Cadmium	7.8/6.7	16	<5	<5	11	<5	23	16	<5
Calcium	230,000/352,000	473,000	323,000	228,000	361,000	178,000	960,000	488,000	132,000
Chromium (total)	27/R	222	10J	<10	1,370	10J	1,310	867	<10
Chromium (Hex.)	<10/<10	<10	10J	<10	<10	10J	<10	<10	<10
Cobalt	<50/<50	<50	<50	<50	<50	<50	76	53	<50
Copper	R/R	<25	<25	<25	1,150	<25	644	R	<25
Cyanide	2,700/2,850	50	33	40	40	21	11	<10	<10
Iron	R/R	16,800	12,300	<100	51,900	6,780	114,000	260,000	1,060
Lead	R/R	57	<5	<5	61	<5	388	240	<5
Magnesium	64,400/89,600	138,000	139,000	37,800	58,500	41,800	209,000	130,000	34,900
Manganese	R/R	1,690	743	1,390	1,980	568	11,200	5,120	674
Mercury	<0.2/<0.2	<0.2	<0.2	<0.2	2.7	<0.2	0.9	0.3	<0.2
Nickel	4,810/5,650	11,600	2,440	2,210	2,450	881	1,350	601	39
Potassium	114,000/118,000	92,600	104,000	41,200	28,300	22,500	13,400	13,100	7,040
Selenium	R/R	R	R	R	R	<5	R	R	<5
Silver	<10/<10	<10	<10	<10	<10	<10	<10	<10	<10
Sodium	543,000/551,000	298,000	320,000	132,000	120,000	103,000	196,000	153,000	103,000
Thallium	<10/<10	<10	<10	<10	<10	<10	<10	<10	<10
Vanadium	<50/<50	<50	<50	<50	<50	<50	65	120	<50
Zinc	R/R	4,910	103	214	1,090	57	782	537	<20

R - Unusable Data
(a) - Unfiltered Samples
(b) - Duplicates
J - Detection Limit Estimated

AUTO ION SITE
KALAMAZOO, MICHIGAN

TABLE 4-8 (Continued)

RESULTS OF GROUNDWATER ANALYSES (µg/l)
ORGANIC COMPOUNDS

	MW-1			MW-2			MW-3A			MW-3B		
Date	11/87	3/88	12/90	11/87	3/88	12/90	11/87	3/88	12/90	11/87	3/88	12/90
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10/<10	<10	<10	<10	<10/<10
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10/<10	<10	<10	<10	<10/<10
Methylene Chloride	<5	<5	<5	<5	<5	<5	11	<5/<5	<5	<5	R	<5/<5
Trans-1,2-Dichloroethene	<5	<5	<5	<5	<5	<5	86	150/91	<5	<5	<5	<5/<5
1,2-Dichloroethene (total)	<5	<5	<5	<5	<5	<5	<5	<5/<5	31	<5	<5	<5/<5
1,2-Dichloroethane	<5	<5	<5	<5	<5	<5	<5	<5/<5	<5	<5	<5	<5/<5
Chloroform	<5	<5	<5	6	31	6	<5	<5/<5	<5	<5	<5	<5/<5
Trichloroethene	<5	<5	<5	5	<5	<5	92	100/62	<5	<5	<5	<5/<5
Tetrachloroethene	7	6	9	<5	<5	<5	<5	<5/<5	<5	<5	<5	<5/<5
1,2-Dichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10/<10	<10	<10	<10	<10J/<10J
2,4-Dimethylphenol	<10	<10	<10	<10	<10	<10	<10	<10/<10	<10	<10	<10	<10J/<10J
2,4,6-Trichlorophenol	<10	<10	<10	<10	<10	<10	22	<10/<10	<10	<10	<10	<10J/<10J
Diethylphthalate	<10	<10	<10	<10	22*	<10	<10	<10/<10	<10	<10	<10	<10J/<10J
Di-n-butylphthalate	150 B	<10	<10	100 B	<10	<10	140 B	<10/<10	<10	120 B	<10	<10J/<10J
Bis(2-ethylhexyl)-phthalate	24 B	<10	<10	50 B	<10	<10	30 B	<10/<10	43 B	24 B	<10	<10J/<10J

B - Compound detected in blank
R - Unuseable data
* - No blank data for round 2
J - Estimated value

Note: All other USEPA Target Compound List (TCL) Volatile Organics and semi-volatile organics were non-detectable for all three sampling rounds. TCL Pesticides were also analyzed during the 11/87 sampling event and found to be non-detectable.

AUTO ION SITE
KALAMAZOO, MICHIGAN

TABLE 4-8 (Continued)

RESULTS OF GROUNDWATER ANALYSES (µg/l)
ORGANIC COMPOUNDS

	MW-4			MW-5			MW-6		
	11/87	3/88	12/90	11/87	3/88	12/90	11/87	3/88	12/90
Chloromethane	<10/<10	<10	38 J	<10	<10	<10	<10	<10	12 J
Vinyl Chloride	35/40	<10	48 J	24	<10	<10	<10	<10	<10 J
Methylene Chloride	560/550	R	<5	6	R	<5	<5	<5	<5 J
Trans-1,2-Dichloroethene	170/180	16	<5	<5	<5	<5	<5	<5	<5 J
1,2-Dichloroethene (total)	<5/<5	<5	180	<5	<5	10	<5	<5	<5 J
1,2-Dichloroethane	45/45	<5	<5	<5	<5	<5	<5	<5	<5
Chloroform	95/90	19	<5	<5	<5	<5	<5	<5	<5 J
Trichloroethene	410/420	160	160	15	<5	<5	<5	<5	<5 J
Tetrachloroethene	<5/<5	<5	<5	<5	<5	<5	<5	<5	<5 J
1,2-Dichlorobenzene	20/28	26	19 J	<10	<10	<10 J	<10	<10	<10 J
2,4-Dimethylphenol	<10/<10	<10	<10 J	<10	<10	<10 J	<10	<10	<10 J
2,4,6-Trichlorophenol	<10/<10	<10	<10 J	<10	<10	<10 J	<10	<10	<10 J
Diethylphthalate	<10/<10	<10	<10 J	<10	<10	<10 J	<10	<10	<10 J
Di-n-butylphthalate	100 B/74 B	<10	<10 J	<10	<10	<10 J	130 B	<10	<10 J
Bis(2-ethylhexyl)-phthalate	22 B/16 B	<10	<10 J	20 B	<10	<10 J	110 B	<10	<10 J

B - Compound detected in blank
R - Unuseable data
* - No blank data for round 2
J - Estimated value

Note: All other USEPA Target Compound List (TCL) volatile organics and semi-volatile organics were non-detectable for all three sampling rounds. TCL Pesticides were also analyzed during the 11/87 sampling event and found to be non-detectable.

5.0 CONCLUSION

The groundwater elevations, and the potentiometric surface maps, show several drastic flow reversals and gradient changes. An analysis of this data, along with the river level, indicates that the direction of groundwater flow at the site appears to be controlled by the Kalamazoo River.

A review of the analytical data shows that fewer compounds have been identified in Round III than in Rounds I and II. Furthermore, those compounds that have been identified in Round III are, in general, at lower concentrations. The lower concentrations may be, in part, due to variations in elevations and corresponding variable flow directions of groundwater.

Although variable, the data obtained from the three sampling rounds is sufficient for a feasibility study (FS). A FS for the groundwater will be prepared including a baseline risk assessment which incorporates the Round III groundwater sampling results. The FS will also consider the possible use of alternative concentration limits (ACLs) when evaluating remedial alternatives.

APPENDIX A

ANALYTICAL DATA

SUMMARY OF ANALYTICAL DATA VALIDATION
AUTO ION THIRD ROUND GROUNDWATER SAMPLING
Project #684-02

Volatile Analysis
Samples Received: 12/8/90

Laboratory Reference Numbers:

5-21072,	5-21073	GW-MW-1-90-12-6.....	53288
5-21071,	5-21070	GW-MW-2-90-12-6.....	53289
5-21056,	5-21057	GW-MW-3A-90-12-6.....	53290
5-21054,	5-21055	GW-MW-3B-90-12-6.....	53291
5-18737,	5-18738	GW-MW-3B-90-12-6-D.....	53292
5-19424,	5-19423	GW-MW-4-90-12-6.....	53293
5-19425,	5-19426	GW-MW-5-90-12-6.....	53294
5-18736,	5-19448	GW-MW-5-90-12-6-MS.....	53295
5-19498,	5-19447	GW-MW-5-90-12-6-MSD.....	53296
5-19441,	5-19440	GW-MW-6-90-12-6.....	53297
5-19497,	5-18723	FB-90-12-6.....	53298
5-18713,	5-18705	TB-90-12-6.....	53299

Samples were analyzed for volatile compounds according to CLP protocol. Analytical validation was performed based upon the following parameters:

* - Chain of Custody
  - Data Completeness
* - Holding Times
* - GC/MS Tuning
  - Calibrations
* - Field and Laboratory Blanks
  - Surrogate Recoveries
  - Matrix Spike / Matrix Spike Duplicate
* - Field Duplicates
* - Internal Standard Performance
* - Compound Identification
* - Compound Quantitation

* - Indicates that all criteria were met for this parameter.

VALIDATION SUMMARY

The analytical report satisfies all USEPA criteria specified in the Quality Assurance Project Plan for this site.

DATA COMPLETENESS

All samples were analyzed with appropriate quality control.

HOLDING TIMES

Holding times were not exceeded for any of the samples.

CALIBRATIONS

The appropriate initial and continuing calibrations were performed. All RRFs and % RSDs were within specifications except for one continuing calibration had a % RSD of 25.5% for chloroform. None of the samples associated with that calibration contained chloroform, however, so this did not present a problem.

BLANKS

No contamination was present in the laboratory blanks, the field blank, or the trip blank.

SURROGATE RECOVERIES

Due to foaming problems, two surrogate recoveries were not within control limits for sample GW-MW-6-90-12-6. When re-analyzed, only one surrogate was above the upper control limit, so all positive results were qualified as estimated.

MATRIX SPIKE SAMPLES

The matrix spike sample was GW-MW-6-90-12-6. The recovery of 1,1-Dichloroethene was above the advisory limit in the matrix spike duplicate, but this compound was not detected in any of the samples. All other spike recoveries were within the advisory limits.

DUPLICATE SAMPLES

The field duplicate samples were GW-MW-3B-90-12-6 and GW-MW-3B-90-12-6-D. No volatile compounds were detected in either of these samples.

The laboratory mistakenly analyzed the MS and MSD of GW-MW-6-90-12-6 as separate samples, therefore these results may be looked at as duplicate analyses as well. The comparison of these sample results showed excellent reproducibility.

SAMPLE RESULTS

Sample GW-MW-6-90-12-6 exhibited foaming problems during the purge step of the analysis, resulting in poor surrogate recoveries and internal standard performance. The re-analysis had only one surrogate above the upper control limit and was performed within the sample holding time.

Sample GW-MW-4-90-12-6 required dilution due to foaming problems during the purge step of the analysis, resulting in

elevated detection limits for this sample.

Data Summary Table
Auto Ion

Volatile Organics
Samples Received: 12/8/90

Sample	Method Blank Conc. ppb	Lab Reported Conc. ppb	QA Validation Reported Conc. Decision	Validation Decision	Footnotes
GW-MW-1-90-12-6 (Lab #: 53288)					
Tetrachloroethene	U	9	9		
GW-MW-2-90-12-6 (Lab #: 53289)					
Chloroform	U	6	6		
GW-MW-3A-90-12-6 (Lab #: 53290)					
1,2-Dichloroethene (total)	U	31	31		
Ethylbenzene	U	4 J	4 J		
Non-Target Volatile Compounds					
4 Unknown					
GW-MW-3B-90-12-6 (Lab #: 53291)	U	U	U		
GW-MW-3B-90-12-6-D (Lab #: 53292)	U	U	U		
GW-MW-4-90-12-6 (Lab #: 53293)					
Chloromethane	U	38 J	38 J		
Vinyl chloride	U	48 J	48 J		
1,2-Dichloroethene (total)	U	180	180		
Trichloroethene	U	160	160		
GW-MW-5-90-12-6 (Lab #: 53294)					
1,2-Dichloroethene (total)	U	10	10		

Data Summary Table
Auto Ion

Volatile Organics
Samples Received: 12/8/90

Sample	Method Blank Conc. ppb	Lab Reported Conc. ppb	QA Validation Reported Conc. Decision	Validation Decision	Footnotes
GW-MW-6-90-12-6 (Lab #: 53297)					
Chloromethane	U	12	12 J		1
FB-90-12-6 (Lab #: 53298)	U	U	U		
TB-90-12-6 (Lab #: 53299)	U	U	U		

FOOTNOTES FOR THE VOLATILE ORGANIC TARGET COMPOUND LIST

1. One surrogate recovery for this sample was greater than the upper control limit, so all results for this fraction are estimated.

SUMMARY OF ANALYTICAL DATA VALIDATION
AUTO ION THIRD ROUND GROUNDWATER SAMPLING
Project #684-02

Semi-volatile Analysis
Samples Received: 12/8/90

Laboratory Reference Numbers:

5-19449, 5-21076	GW-MW-1-90-12-6.....	53300
5-21066, 5-21067	GW-MW-2-90-12-6.....	53301
5-21061, 5-21060	GW-MW-3A-90-12-6.....	53302
5-19402, 5-19418	GW-MW-3B-90-12-6.....	53303
5-18742, 5-18741	GW-MW-3B-90-12-6-D.....	53304
5-19407, 5-19408	GW-MW-4-90-12-6.....	53305
5-19430, 5-19429	GW-MW-5-90-12-6.....	53306
5-18732, 5-18733	GW-MW-5-90-12-6-MS.....	53307
5-18944, 5-18701	GW-MW-5-90-12-6-MSD.....	53308
5-19436, 5-19437	GW-MW-6-90-12-6.....	53309
5-18725, 5-18727	FB-90-12-6.....	53310

Samples were analyzed for semi-volatile compounds according to CLP protocol. Analytical validation was performed based upon the following parameters:

* - Chain of Custody
- Data Completeness
- Holding Times
* - GC/MS Tuning
* - Calibrations
* - Field and Laboratory Blanks
* - Surrogate Recoveries
* - Matrix Spike / Matrix Spike Duplicate
* - Field Duplicates
* - Internal Standard Performance
* - Compound Identification
* - Compound Quantitation

VALIDATION SUMMARY

The analytical report satisfies all USEPA criteria specified in the Quality Assurance Project Plan for this site.

DATA COMPLETENESS

All samples were analyzed with appropriate quality control.

HOLDING TIMES

Extraction holding times were exceeded by one day for the following samples:

GW-MW-3B-90-12-6
GW-MW-3B-90-12-6-D
GW-MW-4-90-12-6
GW-MW-5-90-12-6
GW-MW-6-90-12-6
FB-90-12-6.

Although these samples results were qualified as estimated, the holding time exceedance was minimal, and the data is considered usable.

Analysis holding times were met for all samples.

CALIBRATIONS

The appropriate initial and continuing calibrations were performed with all RRFs and % RSDs being within specifications. All samples were analyzed within the 12-hour time period following calibration.

BLANKS

The field blank showed low level contamination of bis (2-ethylhexyl) phthalate, a common laboratory contaminant.

One of the two associated method blanks showed contamination of unknown TICs at fairly low levels; the other method blank showed no contamination.

SURROGATE RECOVERIES

Surrogate recoveries were all within control limits.

MATRIX SPIKE SAMPLES

Matrix spike samples were not noted by the laboratory during sample log-in, and were therefore analyzed as additional samples. The analyst chose to spike sample GW-MW-1-90-12-6 which resulted in elevated detection limits for this sample.

The matrix spike recoveries were all within the advisory limits.

DUPLICATE SAMPLES

The field duplicates were samples GW-MW-3B-90-12-6 and GW-MW-3B-90-12-6-D. Neither sample contained TCL compounds, although GW-MW-3B-90-12-6 did contain low levels of TICs.

SAMPLE RESULTS

Sample GW-MW-1-90-12-6 had elevated detection limits due to the above-noted laboratory error.

Data Summary Table
Auto Ion

Semivolatile Organics
Samples Received: 12/8/90

Sample	Method Blank Conc. ppb	Lab Reported Conc. ppb	QA Validation Reported Conc. Decision	Validation Decision	Footnotes
GW-MW-1-90-12-6 (Lab #: 53300)	U	U	U		
GW-MW-2-90-12-6 (Lab #: 53301)	U	U	U		
Non-Target Semivolatile Compounds					
3 Unknown					
GW-MW-3A-90-12-6 (Lab #: 53302)					
bis (2-ethylhexyl) phthalate	U	43	43 B	negate	1
Non-Target Semivolatile Compounds					
15 Various Hydrocarbons					
5 Unknown					
GW-MW-3B-90-12-6 (Lab #: 53303)	U	U	UJ		2
Non-Target Semivolatile Compounds					
9 Unknown					
GW-MW-3B-90-12-6-D (Lab #: 53304)	U	U	UJ		2
GW-MW-4-90-12-6 (Lab #: 53305)					
1,2-dichlorobenzene	U	19	19 J		2
2,4-dimethylphenol	U	2 J	2 J		2
Non-Target Semivolatile Compounds					
2-methyl benzenesulfonamide	U	10 J	10 J		2
6 Unknown					

Data Summary Table
Auto Ion

Semivolatile Organics
Samples Received: 12/8/90

Sample	Method Blank Conc. ppb	Lab Reported Conc. ppb	QA Validation Reported Conc. Decision	Validation Decision	Footnotes
GW-MW-5-90-12-6 (Lab #: 53306)	U	U	UJ		2
Non-Target Semivolatile Compounds					
2-butoxy ethanol		40 J	40 J		2
GW-MW-6-90-12-6 (Lab #: 53309)	U	U	UJ		2
Non-Target Semivolatile Compounds					
4 Various Hydrocarbons					
FB-90-12-6 (Lab #: 53310)					
bis (2-ethylhexyl) phthalate	U	11	11 J		2

FOOTNOTES FOR THE SEMI-VOLATILE ORGANIC TARGET COMPOUND LIST

1. The reported compound was less than 5X (10X for the common EPA contaminants) the value of the associated method blank or the associated field blank. The presence of this compound in the sample has been negated.

2. All semivolatile concentrations are estimated for this sample because extraction holding times were exceeded.

SUMMARY OF ANALYTICAL DATA VALIDATION
AUTO ION THIRD ROUND GROUNDWATER SAMPLING
Project #684-02

Hexavalent Chromium Analysis
Samples Received: 12/6/90

Laboratory Reference Numbers:

5-21074, 5-21075	GW-MW-1-90-12-6.....	864200
5-21068, 5-21069	GW-MW-2-90-12-6.....	864202
5-21058, 5-21059	GW-MW-3A-90-12-6.....	864204
5-21052, 5-21053	GW-MW-3B-90-12-6.....	864206
5-18739, 5-18740	GW-MW-3B-90-12-6-D.....	864208
5-19409, 5-19410	GW-MW-4-90-12-6.....	864210
5-19427, 5-19428	GW-MW-5-90-12-6.....	864212
5-18735, 5-18734	GW-MW-5-90-12-6-MS.....	864214
5-19499, 5-19500	GW-MW-5-90-12-6-MSD.....	864216
5-19438, 5-19439	GW-MW-6-90-12-6.....	864218
5-18726, 5-19446	FB-90-12-6.....	864220

Samples were analyzed for hexavalent chromium by SW846 Method 7196 according to USEPA specifications documented in "Standard Operating Procedures for the Colorimetric Determination of Hexavalent Chromium," dated October 12, 1990, and revised October 19, 1990. Analytical validation was performed based upon the following parameters:

* * - Chain of Custody
* * - Data Completeness
* * - Holding Times
* * - Calibrations
* * - Field and Laboratory Blanks
* * - Laboratory Control Samples
* * - Duplicate Analysis
* * - Matrix Spike / Matrix Spike Duplicate
* * - Compound Quantitation

* - Indicates that all criteria were met for this parameter.

VALIDATION SUMMARY

The analytical report satisfies all USEPA criteria specified in the Quality Assurance Project Plan for the site.

DATA COMPLETENESS

All samples were analyzed with appropriate quality control.

HOLDING TIMES

All samples were analyzed within the 24-hour holding time. The first sample was taken at 1:30 p.m. on December 6, 1990, and the laboratory notebook indicates that all sample analyses were completed by 1:30 p.m. on December 7, 1991.

BLANKS

The field blank and laboratory blank contained no hexavalent chromium.

Turbidity blanks were run for every sample and their absorbance was background subtracted from the sample absorbance before quantitation.

LABORATORY CONTROL SAMPLES

The recoveries for both of the laboratory control samples were within the acceptable limits.

TRIVALENT CHROMIUM SPIKE

Both a trivalent chromium spike and a trivalent/hexavalent chromium mixture spike were analyzed to determine if trivalent chromium was detected by this method. Nothing was detected in the trivalent spike, and only the hexavalent chromium was detected in the mixture of the two.

DUPLICATE SAMPLES

The field duplicate (GW-MW-3B-90-12-6) results were both less than the method detection limit. The laboratory duplicate chosen by the analyst was also the field duplicate, and so again the results were less than the detection limit.

MATRIX SPIKE SAMPLES

The matrix spike recoveries were within the advisory limits.

CALIBRATION

An initial five point calibration curve was prepared prior to the analyses, and the correlation coefficient was acceptable. Calibration check samples were analyzed at appropriate intervals and were within acceptable ranges.

SAMPLE RESULTS

Reported results for samples GW-MW-4-90-12-6 and GW-MW-5-90-12-6 (as well as its MS and MSD) have been rounded down to 10 ug/L, probably due to a question of significant figures. The actual values are 14 and 15 ug/L, respectively.

Data Summary Table
Auto Ion

Hexavalent Chromium
Samples Received: 12/6/90

Sample	Lab Reported Conc. ppb	QA Validation Reported Conc. Decision
GW-MW-1-90-12-6 (Lab #: 864200)	U	U
GW-MW-2-90-12-6 (Lab #: 864202)	220	220
GW-MW-3A-90-12-6 (Lab #: 864204)	20	20
GW-MW-3B-90-12-6 (Lab #: 864206)	U	U
GW-MW-3B-90-12-6-D (Lab #: 864208)	U	U
GW-MW-4-90-12-6 (Lab #: 864210)	10	10 J
GW-MW-5-90-12-6 (Lab #: 864212)	10	10 J
GW-MW-6-90-12-6 (Lab #: 864218)	U	U
GW-FB-90-12-6 (Lab #: 864220)	U	U

SUMMARY OF ANALYTICAL DATA VALIDATION
AUTO ION THIRD ROUND GROUNDWATER SAMPLING
Project #684-02

Inorganic Analysis
Samples Received: 12/8/90

Laboratory Reference Numbers:

5-18702,	5-19417	GW-MW-1-90-12-6.....	53300
5-21065,	5-21064	GW-MW-2-90-12-6.....	53301
5-21062,	5-21063	GW-MW-3A-90-12-6.....	53302
5-19403,	5-19404	GW-MW-3B-90-12-6.....	53303
5-18745,	5-18743	GW-MW-3B-90-12-6-D.....	53304
5-19406,	5-19405	GW-MW-4-90-12-6.....	53305
5-19432,	5-19431	GW-MW-5-90-12-6.....	53306
5-18730,	5-18731	GW-MW-5-90-12-6-MS.....	53307
5-18722,	5-18724	GW-MW-5-90-12-6-MSD.....	53308
5-19435,	5-19434	GW-MW-6-90-12-6.....	53309
5-18729,	5-18728	FB-90-12-6.....	53310

Samples were analyzed for volatile compounds according to CLP protocol. Analytical validation was performed based upon the following parameters:

* - Chain of Custody
* - Data Completeness
* - Holding Times
* - Field and Laboratory Blanks
* - Calibrations
* - ICP Interference Check Samples
  - Laboratory Control Samples
* - Duplicate Sample Analysis
  - Matrix Spike Sample Analysis
  - Furnace Atomic Absorption QC
* - ICP Serial Dilution
* - Sample Result Verification
* - Field Duplicates

* - Indicates that all criteria were met for this parameter.

VALIDATION SUMMARY

The analytical report satisfies all USEPA criteria specified in the Quality Assurance Project Plan for this site.

DATA COMPLETENESS

All samples were analyzed with appropriate quality control.

HOLDING TIMES

Holding times were met for all samples.

CALIBRATIONS

Calibration verification standards were within control limits for all samples. Correlation coefficients were acceptable for all Atomic Absorption, mercury, and cyanide analyses.

BLANKS

Selenium was detected in the laboratory blanks, but at a level between the IDL and the CRDL. All other laboratory blanks were acceptable.

The field blank contained low levels of inorganic compounds which are commonly found in both water and soil.

ICP INTERFERENCE CHECK SAMPLE

The ICS was run at appropriate intervals and results were within the specified control limits.

LABORATORY CONTROL SAMPLE

Potassium was not added to the LCS spiking solution, therefore the % recovery cannot be quantitated. Since potassium is a naturally-occurring compound which is not of significant environmental concern, this is not seen as a problem.

All other LCS recoveries were within the prescribed control limits.

DUPLICATE SAMPLE ANALYSIS

Duplicate analysis for lead was within control limits if the upper control limit is defined as the CRDL added to the IDL. The laboratory qualified this as out of control limits, but validation does not. Moreover, lead was not detected in any of the samples.

All other duplicate analysis results were within control limits.

MATRIX SPIKE SAMPLE ANALYSIS

The % recovery for selenium is below its lower control limit; all detections for this element are qualified as estimated, and all non-detections are qualified as estimated non-detections.

The % recovery for arsenic was calculated incorrectly and is

actually 87.5%, which is within the control limits, therefore the arsenic results were not qualified as estimated for matrix spike recovery non-compliance.

The % recovery for cyanide was below the lower control limit, so a post digestion spike was performed. The recovery of the post digestion spike was 99 %, so cyanide results were not qualified as estimated for matrix spike recovery non-compliance.

All other matrix spike recoveries were within control limits.

FURNACE ATOMIC ABSORPTION QC

The post digestion spike recovery for selenium for sample GW-MW-4-90-12-6 was 0 %, making the selenium data for this sample unusable.

Other post digestion spike recoveries were qualified with "W"s, indicating that the data result is estimated. The sample and data is summarized below:

Sample	Compound	Bias
GW-MW-1-90-12-6	Selenium	low
GW-MW-2-90-12-6	Arsenic	low
GW-MW-3A-90-12-6	Arsenic	low
GW-MW-3B-90-12-6-D	Arsenic	high
GW-MW-4-90-12-6	Thallium	low
GW-MW-5-90-12-6	Selenium	low
GW-MW-6-90-12-6	Selenium	low
	Thallium	high
FB-90-12-6	Selenium	high
	Thallium	high

ICP SERIAL DILUTION

ICP Serial Dilution was performed and acceptance criteria were met.

SAMPLE RESULT VERIFICATION

Sample GW-MW-5-90-12-6 does not need to be qualified with a "+" because it was run twice, and the first time its spike was within the control limits of 85-115% (see raw data for NET sample #53306).

The result for mercury in sample GW-MW-3A-90-12-6 was reported as 3.30 ppb on Form I, while the raw data sheets result of 3.4 ppb.

Arsenic results for samples GW-MW-4-90-12-6 and GW-MW-5-90-12-6 were changed by validation because the laboratory results reported for these were neither the original sample result nor the Method of Standard Addition (MSA) result, but apparently

a combination of the two. Since the MSA correlation coefficient was not acceptable, the validation result reported is the original value obtained.

FIELD DUPLICATE ANALYSIS

The field duplicate samples were GW-MW-3B-90-12-6 and GW-MW-3B-90-12-6-D. The duplicate results were very close or identical for all inorganic compounds.

Data Summary Table
Auto Ion

Metals
Samples Received: 12/6/90

Sample: GW-MW-1-90-12-6 (Lab #: 53300)	Lab Reported Conc. ppb		QA Validation Reported Conc. Decision		Validation Decision	Footnotes
Aluminum	U		U			
Antimony	U		U			
Arsenic	U	N	U			8
Barium	63	B	63	U	negate	1
Beryllium	U		U			
Cadmium	U		U			
Calcium	152,000		152,000			
Chromium	U		U			
Cobalt	U		U			
Copper	U		U			
Cyanide	U		U			
Iron	U		U			
Lead	U	*	U			9
Magnesium	38,800		38,800			
Manganese	115		115			
Mercury	U		U			
Nickel	29	B	29			
Potassium	5,640		5,640			
Selenium	4	BN	4	UJ	negate	1,3,5
Silver	U		U			
Sodium	148,000		148,000			
Thallium	U		U			
Vanadium	U		U			
Zinc	U		U			

Laboratory Qualifier Key
B - The reported value is less than the Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).
N - The spiked sample recovery for this compound was not within control limits.
W - Post digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance for this sample.
E - The reported value is estimated because of the presence of interference.
+ - Correlation coefficient for the Method of Standard Addition is less than 0.995.
* - Duplicate analysis not within control limits.

Validation Qualifier Key
U - This compound was determined to be below detection levels due to various qualifications (see footnotes).
J - The result for this compound was determined to be estimated (see footnotes).

Data Summary Table
Auto Ion

Metals
Samples Received: 12/6/90

Sample: GW-MW-2-90-12-6 (Lab #: 53301)	Lab Reported Conc. ppb	QA Validation Reported Conc. Decision	Validation Decision	Footnotes
Aluminum	U	U		
Antimony	U	U		
Arsenic	U N	U J		5,8
Barium	82 B	82		
Beryllium	U	U		
Cadmium	U	U		
Calcium	151,000	151,000		
Chromium	151	151		
Cobalt	U	U		
Copper	U	U		
Cyanide	U	U		
Iron	U	U		
Lead	U *	U		9
Magnesium	28,800	28,800		
Manganese	248	248		
Mercury	U	U		
Nickel	281	281		
Potassium	6,600	6,600		
Selenium	3 BN	3 UJ	negate	1,2
Silver	U	U		
Sodium	122,000	122,000		
Thallium	U	U		
Vanadium	U	U		
Zinc	U	U		

Laboratory Qualifier Key

B – The reported value is less than the Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).
N – The spiked sample recovery for this compound was not within control limits.
W – Post digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance for this sample.
E – The reported value is estimated because of the presence of interference.
+ – Correlation coefficient for the Method of Standard Addition is less than 0.995.
* – Duplicate analysis not within control limits.

Validation Qualifier Key

U – This compound was determined to be below detection levels due to various qualifications (see footnotes).
J – The result for this compound was determined to be estimated (see footnotes).

Data Summary Table
Auto Ion

Metals
Samples Received: 12/6/90

Sample: GW-MW-3A-90-12-6 (Lab #: 53302)	Lab Reported Conc. ppb		QA Validation Reported Conc. Decision		Validation Decision	Footnotes
Aluminum	U		U			
Antimony	U		U			
Arsenic	4	BNW	4	J		5,8
Barium	39	B	39	U	negate	1
Beryllium	U		U			
Cadmium	U		U			
Calcium	242,000		242,000			
Chromium	U		U			
Cobalt	U		U			
Copper	U		U			
Cyanide	12		12			
Iron	12,400		12,400			
Lead	U	*	U			9
Magnesium	27,900		27,900			
Manganese	1,170		1,170			
Mercury	3.3		3.4			
Nickel	40		40			
Potassium	31,900		31,900			
Selenium	U	N	U	J		1,3
Silver	U		U			
Sodium	90,100		90,100			
Thallium	U		U			
Vanadium	U		U			
Zinc	U		U			

Laboratory Qualifier Key

B – The reported value is less than the Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).
N – The spiked sample recovery for this compound was not within control limits.
W – Post digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance for this sample.
E – The reported value is estimated because of the presence of interference.
+ – Correlation coefficient for the Method of Standard Addition is less than 0.995.
* – Duplicate analysis not within control limits.

Validation Qualifier Key

U – This compound was determined to be below detection levels due to various qualifications (see footnotes).
J – The result for this compound was determined to be estimated (see footnotes).

Data Summary Table
Auto Ion

Metals
Samples Received: 12/6/90

Sample: GW-MW-3B-90-12-6 (Lab #: 53303)	Lab Reported Conc. ppb		QA Validation Reported Conc. Decision		Validation Decision	Footnotes
Aluminum	U		U			
Antimony	U		U			
Arsenic	U	N	U			8
Barium	49	B	49	U	negate	1
Beryllium	U		U			
Cadmium	U		U			
Calcium	166,000		166,000			
Chromium	U		U			
Cobalt	U		U			
Copper	U		U			
Cyanide	U		U			
Iron	1,800		1,800			
Lead	U	*	U			9
Magnesium	47,700		47,700			
Manganese	243		243			
Mercury	U		U			
Nickel	U		U			
Potassium	3,610	B	3,610			
Selenium	U	N	U	J		3
Silver	U		U			
Sodium	108,000		108,000			
Thallium	U		U			
Vanadium	U		U			
Zinc	16	B	16			

Laboratory Qualifier Key

B - The reported value is less than the Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).
N - The spiked sample recovery for this compound was not within control limits.
W - Post digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance for this sample.
E - The reported value is estimated because of the presence of interference.
+ - Correlation coefficient for the Method of Standard Addition is less than 0.995.
* - Duplicate analysis not within control limits.

Validation Qualifier Key

U - This compound was determined to be below detection levels due to various qualifications (see footnotes).
J - The result for this compound was determined to be estimated (see footnotes).

Data Summary Table
Auto Ion

Metals
Samples Received: 12/6/90

Sample: GW-MW-38-90-12-6-D (Lab #: 53304)	Lab Reported Conc. ppb		QA Validation Reported Conc. Decision		Validation Decision	Footnotes
Aluminum	U		U			
Antimony	U		U			
Arsenic	U	NW	U	J		5,8
Barium	50	B	50	U	negate	1
Beryllium	U		U			
Cadmium	U		U			
Calcium	166,000		166,000			
Chromium	U		U			
Cobalt	U		U			
Copper	U		U			
Cyanide	U		U			
Iron	1,880		1,880			
Lead	U	*	U			9
Magnesium	47,700		47,700			
Manganese	245		245			
Mercury	U		U			
Nickel	U		U			
Potassium	3,700	B	3,700			
Selenium	U	N	U	J		3
Silver	U		U			
Sodium	108,000		108,000			
Thallium	U		U			
Vanadium	U		U			
Zinc	12	B	12			

Laboratory Qualifier Key

B – The reported value is less than the Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).
N – The spiked sample recovery for this compound was not within control limits.
W – Post digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance for this sample.
E – The reported value is estimated because of the presence of interference.
+ – Correlation coefficient for the Method of Standard Addition is less than 0.995.
* – Duplicate analysis not within control limits.

Validation Qualifier Key

U – This compound was determined to be below detection levels due to various qualifications (see footnotes).
J – The result for this compound was determined to be estimated (see footnotes).

Data Summary Table
Auto Ion

Metals
Samples Received: 12/6/90

Sample: GW-MW-4-90-12-6 (Lab #: 53305)	Lab Reported Conc. ppb		QA Validation Reported Conc. Decision		Validation Decision	Footnotes
Aluminum	U		U			
Antimony	U		U			
Arsenic	41.5	N+	30	J		4,8
Barium	U		U			
Beryllium	U		U			
Cadmium	U		U			
Calcium	323,000		323,000			
Chromium	U		U			
Cobalt	U		U			
Copper	U		U			
Cyanide	33		33			
Iron	12,300		12,300			
Lead	U	*	U			9
Magnesium	139,000		139,000			
Manganese	743		743			
Mercury	U		U			
Nickel	2,440		2,440			
Potassium	104,000		104,000			
Selenium	U	NE	U	R	reject	7
Silver	U		U			
Sodium	320,000		320,000			
Thallium	U	W	U	J		5
Vanadium	U		U			
Zinc	103		103			

Laboratory Qualifier Key

B – The reported value is less than the Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).
N – The spiked sample recovery for this compound was not within control limits.
W – Post digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance for this sample.
E – The reported value is estimated because of the presence of interference.
+ – Correlation coefficient for the Method of Standard Addition is less than 0.995.
* – Duplicate analysis not within control limits.

Validation Qualifier Key

U – This compound was determined to be below detection levels due to various qualifications (see footnotes).
J – The result for this compound was determined to be estimated (see footnotes).

Data Summary Table
Auto Ion

Metals
Samples Received: 12/6/90

Sample: GW-MW-5-90-12-6 (Lab #: 53307)	Lab Reported Conc. ppb		QA Validation Reported Conc. Decision		Validation Decision	Footnotes
Aluminum	205		205			
Antimony	U		U			
Arsenic	18.4	N+	10			6,8
Barium	U		U			
Beryllium	U		U			
Cadmium	U		U			
Calcium	178,000		178,000			
Chromium	6	B	6			
Cobalt	U		U			
Copper	U		U			
Cyanide	21		21			
Iron	6,780		6,780			
Lead	U	*	U			9
Magnesium	41,800		41,800			
Manganese	568		568			
Mercury	U		U			
Nickel	881		881			
Potassium	22,500		22,500			
Selenium	U	NW	U	J		3,5
Silver	U		U			
Sodium	103,000		103,000			
Thallium	U		U			
Vanadium	U		U			
Zinc	57		57			

Laboratory Qualifier Key

B – The reported value is less than the Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).
N – The spiked sample recovery for this compound was not within control limits.
W – Post digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance for this sample.
E – The reported value is estimated because of the presence of interference.
+ – Correlation coefficient for the Method of Standard Addition is less than 0.995.
* – Duplicate analysis not within control limits.

Validation Qualifier Key

U – This compound was determined to be below detection levels due to various qualifications (see footnotes).
J – The result for this compound was determined to be estimated (see footnotes).

Data Summary Table
Auto Ion

Metals
Samples Received: 12/6/90

Sample: GW-MW-6-90-12-6 (Lab #: 53309)	Lab Reported Conc. ppb		QA Validation Reported Conc. Decision		Validation Decision	Footnotes
Aluminum	U		U			
Antimony	U		U			
Arsenic	5	BN	5			
Barium	70	B	70			
Beryllium	U		U			
Cadmium	U		U			
Calcium	132,000		132,000			
Chromium	U		U			
Cobalt	U		U			
Copper	U		U			
Cyanide	U		U			
Iron	1,060		1,060			
Lead	U		U			
Magnesium	34,900		34,900			
Manganese	674		674			
Mercury	U		U			
Nickel	39	B	39			
Potassium	7,040		7,040			
Selenium	U	NW	U	J		3,5
Silver	U		U			
Sodium	103,000		103,000			
Thallium	U	W	U	J		5
Vanadium	U		U			
Zinc	10	B	10			

Laboratory Qualifier Key
B – The reported value is less than the Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).
N – The spiked sample recovery for this compound was not within control limits.
W – Post digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance for this sample.
E – The reported value is estimated because of the presence of interference.
+ – Correlation coefficient for the Method of Standard Addition is less than 0.995.

Validation Qualifier Key
U – This compound was determined to be below detection levels due to various qualifications (see footnotes).
J – The result for this compound was determined to be estimated (see footnotes).

Data Summary Table
Auto Ion

Metals
Samples Received: 12/6/90

Sample: FB-90-12-6 (Lab #: 53310)	Lab Reported Conc. ppb		QA Validation Reported Conc. Decision		Validation Decision	Footnotes
Aluminum	U		U			
Antimony	U		U			
Arsenic	U	N	U			8
Barium	13	B	13			
Beryllium	U		U			
Cadmium	U		U			
Calcium	727	B	727			
Chromium	U		U			
Cobalt	U		U			
Copper	U		U			
Cyanide	U		U			
Iron	83	B	83			
Lead	U	*	U			9
Magnesium	65	B	65			
Manganese	U		U			
Mercury	U		U			
Nickel	U		U			
Potassium	U		U			
Selenium	U	NW	U	J		3,5
Silver	U		U			
Sodium	1,820	B	1,820			
Thallium	U	W	U	J		5
Vanadium	U		U			
Zinc	U		U			

Laboratory Qualifier Key
B – The reported value is less than the Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).
N – The spiked sample recovery for this compound was not within control limits.
W – Post digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance for this sample.
E – The reported value is estimated because of the presence of interference.
+ – Correlation coefficient for the Method of Standard Addition is less than 0.995.
* – Duplicate analysis not within control limits.

Validation Qualifier Key
U – This compound was determined to be below detection levels due to various qualifications (see footnotes).
J – The result for this compound was determined to be estimated (see footnotes).

FOOTNOTES FOR THE INORGANIC TARGET ANALYTE LIST

1. The reported compound was less than 5X (10X for the common EPA contaminants) the value of the associated method blank or the associated field blank. The presence of this compound in the sample has been negated.

2. The matrix spike recovery for this compound was lower than 75%, therefore any positive result is estimated.

3. The matrix spike recovery for this compound was lower than 75%, therefore the detection limit is estimated.

4. This sample was analyzed by the Method of Standard Additions (MSA), but the correlation coefficient was not >0.995. The concentration given here is the result obtained from the original analysis.

5. The furnace post digestion spike was not within the 85-115% control limits and the sample absorbance was <50% of the post digestion spike absorbance, therefore the value is estimated.

6. This sample was analyzed twice due to a laboratory log-in error. The original analysis (NET sample #53306) was within the post digestion spike control limits and did not require the Method of Standard Additions.

7. The post digestion spike recovery of this sample was <10% and the sample result was < the Instrument Detection Limit (IDL), therefore this data was qualified as unusable.

8. The laboratory reported the matrix spike recovery for this compound to be below the lower control limit, but validation determined that a calculation error had been made, and the recovery was within control limits.

9. The laboratory reported the duplicate analysis for this compound to be outside of control limits, but validation determined that it was within control limits.